REPORT RESUMES

ED 018 662 VT 005 003

PROGRAMMING EXERCISES FOR COMPUTER AIDED DRAFTING (TITLE SUPPLIED).

MIAMI-DADE JUNIOR COLL., FLA.

PUB DATE 67

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DESCRIPTORS- *SUMMER INSTITUTES, *COMPUTER ASSISTED INSTRUCTION, COMPUTER PROGRAMS, *DRAFTING, *ENGINEERING DRAWING, PROGRAMING, TEACHER EDUCATION, *INSTRUCTIONAL MATERIALS, CURRICULUM GUIDES,

REFERENCE MATERIAL AND PROGRAMING EXERCISES USED FOR THE COMPUTER AIDED DRAFTING SUMMER INSTITUTE AT MIAMI-DADE JUNIOR COLLEGE, JULY 10-28, 1967, ARE PRESENTED. THE EXERCISES, TO BE PROGRAMED FOR EXECUTION ON THE IBM SYSTEM 1620 WITH AN ON-LINE 1627 PLOTTER, PROVIDE A MEDIUM FOR COVERING AND ENFORCING THE SUBJECT MATERIAL. ALSO INCLUDED ARE (1) THE SUMMER INSTITUTE SCHEDULE, (2) OUTLINES OF SUBJECT MATERIAL FOR LABORATORY LECTURES, DRAFTING LANGUAGE, NUMERIC CONTROL, AND COORDINATE GEOMETRY LANGUAGE, AND (3) A LIST OF 36 PARTICIPANTS. THE FINAL REPORT OF THE INSTITUTE IS VT 004 482. (PS)

ED018662

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

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1967 SUMMER INSTITUTE

MIAMI-DADE JUNIOR COLLEGE

1 Programming Exercises for Computer Aided Drafting
(Title supplied).>

VT005003

PREFACE

This notebook contains the reference material and programming exercises used for the Computer Aided Drafting Summer Institute at Miami-Dade Junior College, July 10-28, 1967.

The exercises are to be programmed for execution on the IBM System 1620 with an on-line 1627 plotter. The exercises provide a medium for covering and enforcing the subject material.

Each participant in the Summer Institute will receive the programmed solutions for the 1620 and the output from the 1627 for the exercises in this notebook. The programs are not necessarily the most efficient and practical solutions to the exercises. These programs attempt to include only that portion of the subject material familiar to the participant and in sequence with the class lecture.

Bruce L. DeSautel

PARTICIPANTS

STATE	SCHOOL	CITY
ALABAMA		
Skinner	W. L. Yancey State Junior College	Bay Minette
CALIFORNIA		
Auerbach	Sacramento City College	Sacramento
Gerevas	Napa Junior College	Vallejo
Gonzalez	Glendale College	Glendale
James	Fullerton Junior College	Fullerton
McVicar	Laney College	Oakland
Peck	American River College	Sacramento
CONNECTICUT		
Bradshaw	Hartford State Technical Institute	Hartford
FLORIDA		
Feldman	Hialeah High School	Miami
Green	Monroe High School	Cocoa
Myers	Satellite High School	Satellite Beach
Sitz	New River High School	Ft. Lauderdale
GEORGIA		
Stewart	Upson County Area Vocational	Thomaston
ILLINOIS		
Marks	Highland Junior College	Freeport
IOWA		
Druart	Des Moines Technical High School	Des Moines
MAINE		
Libby	Portland High School	Portland
Vassar	Central Maine Vocational Technical Institute	Auburn
MASSACHUSETTS		
Levesque	Taunton High School	Taunton
MINNESOTA		
Steen	Duluth Area Institute of Technology	Duluth
NEW YORK		
Grossman	Alex Hamilton Voc & Tech High School	Queens
Mueller	New York City Community College	Brooklyn
OHIO		
Isbell	Lorraine County Community College	Elyria
OKLAHOMA		
Rutledge	Area Vocational-Technical Center	Duncan

PARTICIPANTS
(cont.)

STATE	SCHOOL	CITY
PENNSYLVANIA		
Graves	The Williamsport Area Community College	Williamsport
McQuay	The Williamsport Area Community College	Williamsport
RHODE ISLAND		
Anderson	Pilgrim High School	Warwick
Amend	Warwick Veterans High School	Warwick
Ross	Rhode Island Junior College	Providence
Stafford	Rhode Island Junior College	Providence
Zannini	Roger Williams Junior College	Providence
TEXAS		
Bennett	Kilgore College	Kilgore
Potter	Henderson County Junior College	Athens
UTAH		
Schnirel	Utah Technical College	Salt Lake City
VERMONT		
Given	Rutland Senior High School	Rutland
WASHINGTON		
Putas	Lower Columbia College	Longview
Steele	Spokane Community College	Spokane

1967 SUMMER INSTITUTE
SCHEDULE

FIRST WEEK

MONDAY JULY 10, 1967

	TOPIC	LECTURER	ROOM
8.00- 9.00 A.M.	REGISTRATION		3101
9.00-10.30 A.M.	PRESIDING	DR. G. MEHALLIS DIRECTOR, DIV. OF TECH. VOC. AND SEMI-PROFESSIONAL STUDIES	3101
	WELCOME	MR. A GARNER VICE PRESIDENT	
	FACILITIES	MR. T. KOSCHLER VICE PRESIDENT	
	FLORIDA GREETING	MR. R. CALDWELL STATE DEPT. OF ED.	
	INSTITUTE FORMAT	MR. A. MORPHONIOS INSTITUTE COORDINATOR	
10.30-10.45 A.M.	COFFEE BREAK		
10.45-12.00 A.M.	TOUR OF MIAMI-DADE JUNIOR COLLEGE	MR. A. MORPHONIOS MR. W. TRAVERS	
12.00- 1.00 P.M.	LUNCH		
1.00- 4.30 P.M.	INTRO. DATA PROCESS.	MR. B. DESAUTEL	1155

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TUESDAY JULY 11, 1967

8.00-10.00 A.M.	DRAFTING LANGUAGE	MR. B. DESAUTEL	1155
10.00-12.00 A.M.	LABORATORY, GROUP A	ASSISTANTS	1164
	LABORATORY, GROUP B	ASSISTANTS	1155
12.00- 1.00 P.M.	LUNCH		
1.00- 2.00 P.M.	DRAFTING LANGUAGE	MR. B. DESAUTEL	1155
2.00- 4.00 P.M.	LABORATORY, GROUP A	ASSISTANTS	1155
	LABORATORY, GROUP B	ASSISTANTS	1164
4.00- 4.30 P.M.	OPEN LABORATORY	ASSISTANTS	1164

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	TOPIC	LECTURER	ROOM
WEDNESDAY JULY 12, 1967			
8.00-10.00 A.M.	DRAFTING LANGUAGE	MR. B. DESAUTEL	1155
10.00-12.00 A.M.	LABORATORY, GROUP A	ASSISTANTS	1164
	LABORATORY, GROUP B	ASSISTANTS	1155
12.00- 1.00 P.M.	LUNCH		
1.00- 2.00 P.M.	AIDS PROJECT .	MR. C. SMITH IBM SYSTEMS ENGINEER MIAMI, FLORIDA	3101
2.00- 4.00 P.M.	LABORATORY, GROUP A	ASSISTANTS	1155
	LABORATORY, GROUP B	ASSISTANTS	1164
4.00- 4.30 P.M.	OPEN LABORATORY	ASSISTANTS	1164

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THURSDAY JULY 13, 1967			
8.00-10.00 A.M.	DRAFTING LANGUAGE	MR. B. DESAUTEL	1155
10.00-12.00 A.M.	LABORATORY, GROUP A	ASSISTANTS	1164
	LABORATORY, GROUP B	ASSISTANTS	1155
12.00- 1.00 P.M.	LUNCH		
1.00- 4.30 P.M.	FIELD TRIP MILGO ELECTRONIC CORP. MIAMI, FLORIDA	MR. M. MC HUGH PERSONNEL MANAGER MR. H. THORSEN MARKETING MANAGER	
	AUTOMATED BUILDING COMP. MIAMI, FLORIDA	MR. O. KARSH COMPUTER SYSTEMS ENGR.	

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FRIDAY JULY 14, 1967			
8.00- 9.00 A.M.	DRAFTING LANGUAGE	MR. B. DESAUTEL	1155
9.00-10.30 A.M.	ENGR. DATA MANAGEMENT	MR. A. LEGO THE MARTIN COMPANY ORLANDO, FLORIDA	2151
10.30-12.00 P.M.	DRAFTING LANGUAGE	MR. B. DESAUTEL	1155
12.00- 1.00 P.M.	LUNCH		

	TOPIC	LECTURER	ROOM
1.00- 4.00 P.M.	GRAPHIC SCIENCE	MR. N. MICHELSON SPECIAL REP. IBM CORPORATION POUGHKEEPSIE, N.Y.	2151
4.00- 4.30 P.M.	LABORATORY, GROUP A	ASSISTANTS	1155
	LABORATORY, GROUP B	ASSISTANTS	1164

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SECOND WEEK

MONDAY JULY 17, 1967

8.00-10.00 A.M.	DRAFTING LANGUAGE	MR. B. DESAUTEL	1155
10.00-12.00 A.M.	LABORATORY, GROUP A	ASSISTANTS	1164
	LABORATORY, GROUP B	ASSISTANTS	1155
12.00- 1.00 P.M.	LUNCH		
1.00- 2.00 P.M.	DRAFTING LANGUAGE	MR. B. DESAUTEL	1155
2.00- 4.00 P.M.	LABORATORY, GROUP A	ASSISTANTS	1155
	LABORATORY, GROUP B	ASSISTANTS	1164
4.00- 4.30 P.M.	OPEN LABORATORY	ASSISTANTS	1164

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TUESDAY JULY 18, 1967

8.00-10.00 A.M.	DRAFTING LANGUAGE	MR. B. DESAUTEL	1155
10.00-12.00 A.M.	LABORATORY, GROUP A	ASSISTANTS	1164
	LABORATORY, GROUP B	ASSISTANTS	1155
12.00- 1.00 P.M.	LUNCH		
1.00- 2.00 P.M.	DRAFTING LANGUAGE	MR. B. DESAUTEL	1155
2.00- 4.00 P.M.	LABORATORY, GROUP A	ASSISTANTS	1155
	LABORATORY, GROUP B	ASSISTANTS	1164
4.00- 4.30 P.M.	OPEN LABORATORY	ASSISTANTS	1164

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WEDNESDAY JULY 19, 1967

8.00-10.00 A.M.	DRAFTING LANGUAGE	MR. B. DESAUTEL	1155
10.00-12.00 A.M.	LABORATORY, GROUP A	ASSISTANTS	1164
	LABORATORY, GROUP B	ASSISTANTS	1155
12.00- 1.00 P.M.	LUNCH		

	TOPIC	LECTURER	ROOM
1.00- 2.30 P.M.	STROMBERG-CARLSON CORPORATION	MR. D. LANDRY DISTRICT MANAGER MR. J. PIRKLE SYSTEM REP.	3101
2.30- 4.30 P.M.	LABORATORY, GROUP A	ASSISTANTS	1155
	LABORATORY, GROUP B	ASSISTANTS	1164

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THURSDAY JULY 20, 1967

8.00-10.00 A.M.	DRAFTING LANGUAGE	MR. B. DESAUTEL	1155
10.00-12.00 A.M.	LABORATORY, GROUP A	ASSISTANTS	1164
	LABORATORY, GROUP B	ASSISTANTS	1155
12.00- 1.00 P.M.	LUNCH		
1.00- 2.00 P.M.	DRAFTING LANGUAGE	MR. B. DESAUTEL	1155
2.00- 4.00 P.M.	LABORATORY, GROUP A	ASSISTANTS	1155
	LABORATORY, GROUP B	ASSISTANTS	1164
4.00- 4.30 P.M.	OPEN LABORATORY	ASSISTANTS	1164

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FRIDAY JULY 21, 1967

8.00-10.00 A.M.	REVIEW OF DRAFTING LANG.	MR. B. DESAUTEL	1155
10.00- 2.00 P.M.	OPEN LABORATORY	ASSISTANTS	1164
12.00- 1.00 P.M.	LUNCH		
1.00- 4.30 P.M.	FIELD TRIP INST. OF MARINE SCIENCE UNIVERSITY OF MIAMI	DR. F. SMITH DIRECTOR MR. D. SHAFFER MANAGER COMP. CENTER	

* * *

THIRD WEEK

MONDAY JULY 24, 1967

8.00-11.00 A.M.	LECTURE NUMERIC CONTROL	MR. J. CORBIN	1155
11.00-12.00 A.M.	COMPUDYNE CORPORATION	MR. J. SMITH DIST. SALES ENGR. HATBORO, PA.	3101
12.00- 1.00 P.M.	LUNCH		

	TOPIC	LECTURER	ROOM
1.00- 4.30 P.M.	LABORATORY		3117

* * *

TUESDAY JULY 25, 1967

8.00-12.00 A.M.	LECTURE NUMERIC CONTROL	MR. A. POH	1155
12.00- 1.00 P.M.	LUNCH		
1.00- 4.30 A.M.	LECTURE COGO	MR. B. DESAUTEL	1155

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WEDNESDAY JULY 26, 1967

8.00-10.00 A.M.	LECTURE COGO	MR. B. DESAUTEL	1155
10.00-12.00 A.M.	LABORATORY, GROUP A	ASSISTANTS	1164
	LABORATORY, GROUP B	ASSISTANTS	1155
12.00- 1.00 P.M.	LUNCH		
1.00- 2.00 P.M.	LECTURE COGO	MR. B. DESAUTEL	1155
2.00- 4.00 P.M.	LABORATORY, GROUP A	ASSISTANTS	1155
	LABORATORY, GROUP B	ASSISTANTS	1164
4.00- 4.30 P.M.	OPEN LABORATORY	ASSISTANTS	1164

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THURSDAY JULY 27, 1967

8.00-10.00 A.M.	LECTURE COGO	MR. B. DESAUTEL	1155
10.00-12.00 A.M.	LABORATORY, GROUP A	ASSISTANTS	1164
	LABORATORY, GROUP B	ASSISTANTS	1155
12.00- 1.00 P.M.	LUNCH		
1.00- 2.00 P.M.	LECTURE COGO	MR. B. DESAUTEL	1155
2.00- 4.00 P.M.	LABORATORY, GROUP A	ASSISTANTS	1155
	LABORATORY, GROUP B	ASSISTANTS	1164
4.00- 4.30 P.M.	OPEN LABORATORY	ASSISTANTS	1164

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FRIDAY JULY 28, 1967

8.00-10.00 A.M.	LECTURE COGO	MR. B. DESAUTEL	1155
10.00-12.00 A.M.	OPEN LABORATORY	ASSISTANTS	1164
12.00- 1.30 P.M.	PRESIDENTS LUNCHEON	DR. P. MASIKO PRESIDENT	1324

	TOPIC	LECTURER	ROOM
1.30- 4.30 P.M.	SUMMER INSTITUTE REVIEW	MR. B. DESAUTEL	1155

NOTES,

1. ASSISTANTS MR. L. ROSE
   MR. R. MACFARLANE
   MR. W. THOMPSON

2. ROOM 1164-IBM SYSTEM 1620

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1967 SUMMER INSTITUTE
LABORATORY ASSIGNMENTS

NAME	GROUP	TEAM
AMEND	A	5
ANDERSON	B	6
AUERBACH	B	1
BENNETT	A	5
BRADSHAW	B	2
DRUART	B	3
FELDMAN	A	2
GEREVAS	B	1
GIVEN	A	6
GONZALEZ	A	1
GRAVES	A	4
GREEN	A	2
GROSSMAN	A	4
ISBELL	A	4
JAMES	A	1
LEVESQUE	A	3
LIBBY	A	3
MARKS	A	3
MC QUAY	B	4
MC VICAR	B	1
MUELLER	B	4
MYERS	B	2
PAPPAS	B	6
PECK	A	2
POTTER	B	5
PUTAS	A	6
ROSS	B	5
RUTLEDGE	B	4
SCHNIREL	A	6
SKINNER	A	6
STAFFORD	A	5
STEELE	B	6
STEEN	B	3
STEWART	B	2
VASSER	B	3
ZANNINI	B	5

1967 SUMMER INSTITUTE
LABORATORY ASSIGNMENTS

NAME	GROUP	TEAM
AMEND	A	5
ANDERSON	B	6
AUERBACH	B	1
BENNETT	A	5
BRADSHAW	B	2
DRUART	B	3
FELDMAN	A	2
GEREVAS	B	1
GIVEN	A	6
GONZALEZ	A	1
GRAVES	A	4
GREEN	A	2
GROSSMAN	A	4
ISBELL	A	4
JAMES	A	1
LEVESQUE	A	3
LIBBY	A	3
MARKS	A	3
MC QUAY	B	4
MC VICAR	B	1
MUELLER	B	4
MYERS	B	2
PAPPAS	B	6
PECK	A	2
POTTER	B	5
PUTAS	A	6
ROSS	B	5
RUTLEDGE	B	4
SCHNIREL	A	6
SKINNER	A	6
STAFFORD	A	5
STEELE	B	6
STEEN	B	3
STEWART	B	2
VASSER	B	3
ZANNINI	B	5

1967 SUMMER INSTITUTE
SUBJECT MATERIAL FOR LABORATORY LECTURES

I LABORATORY LECTURE 1

A. HARDWARE CONTAINED IN THE SYSTEM 1620 LABORATORY
   1. 1620 CENTRAL PROCESSING UNIT AND CONSOLE
   2. 1623 CORE STORAGE
   3. 1627 PLOTTER
   4. 1311 DISC STORAGE
   5. 1622 CARD READ PUNCH
   6. 1443 PRINTER
   7. 026 CARD PUNCH

B. PRINCIPLES OF STORED PROGRAM OPERATION
   1. STORAGE AND RETRIEVAL OF DATA
   2. PROGRAMS-A SPECIAL KIND OF DATA

C. LANGUAGES IN WHICH PROGRAMS ARE WRITTEN
   1. MACHINE OR OBJECT LANGUAGE
   2. ASSEMBLY LANGUAGE
   3. FORTRAN
   4. DRAFTING LANGUAGE
   5. COGO

D. DEMONSTRATION
   1. A MACHINE LANGUAGE DRAWING USING THE PLOTTER
   2. A FORTRAN-II PROGRAM
   3. A DRAFTING LANGUAGE PROGRAM

II LABORATORY LECTURE 2

A. OPERATION OF THE 026 PRINTING CARD PUNCH
   1. ALPHABETIC MODE
   2. NUMERIC MODE
   3. CARD CONTROL

B. OPERATION OF THE 1620 CONSOLE
   1. MANUAL AND AUTOMATIC MODES
   2. START AND STOP KEYS
   3. SIGNAL LIGHTS
   4. INPUT AND OUTPUT FROM THE CONSOLE TYPEWRITER

C. OPERATION OF THE 1622 READER
   1. INSERTION OF PUNCHED CARDS
   2. LOADING A PROGRAM
   3. USE OF THE START BUTTON
   4. NONPROCESS RUNOUT
   5. READER LIGHTS

D. OPERATION OF THE 1443 PRINTER
   1. START AND STOP KEYS
   2. CARRIAGE CONTROL

E. OPERATION OF THE 1627 PLOTTER
   1. RAISING AND LOWERING THE DRAWING PEN
   2. MOVEMENT OF THE PEN AND DRUM DURING DRAWING
   3. GROSS AND FINE ADJUSTMENT OF THE PEN POSITION
   4. PLACING AND REMOVAL OF PAPER FOR DRAWINGS

F. FUNCTION OF THE 1311 DISC UNIT
   1. RANDOM ACCESS STORAGE
   2. INTERMEDIATE STORAGE

1967 SUMMER INSTITUTE
SUBJECT MATERIAL FOR DRAFTING LANGUAGE

I INTRODUCTION

II ORIENTATION

A. CLASS OUTLINE
B. STUDENT NOTEBOOKS
C. LABORATORIES

III INTRODUCTION TO DATA PROCESSING

A. HISTORY
B. EVOLUTION OF COMPUTERS
C. 1620 MACHINE LANGUAGE
    1. INSTRUCTIONS
    2. ADDRESSES
    3. LOGIC
    4. ARITHMETIC
D. PRODUCING A PROGRAM

IV PROCEDURE FOR PRODUCING A PROGRAM

V DRAFTING LANGUAGE PROCESSORS

A. COMPILER
B. PART PROCESSOR
C. DRAWING PROCESSOR

VI PARTS OF A DRAFTING LANGUAGE PROGRAM

A. GEOMETRIC GROUPS
    1. VIEW
    2. SHAPE
    3. END
B. OBJECT LINES
C. DRAWING STATEMENTS
    1. SCALE
    2. ORIGIN
    3. DRAW

VII LANGUAGE FORMAT AND CODING

A. LANGUAGE WORDS
    1. MAJOR
    2. MODAL
B. USER-CREATED WORDS
    1. NUMBERS
    2. LABELS
C. PUNCTUATION
    1. COMMA
    2. EQUAL
    3. SLASH
    4. PLUS-MINUS

5. DOLLAR SIGN
6. BLANK

D. LINE CLASSIFICATION
   1. MEDIUM
   2. THICK

VIII POINTS

A. INTRODUCTION
   1. RECTANGULAR COORDINATES
   2. PPP

IX LINES

A. INTRODUCTION
   1. POINT TO POINT
   2. RELATIVE DISTANCE
   3. DISTANCE FROM PPP

X CIRCLES

A. INTRODUCTION
   1. CENTER POINT AND RADIUS

XI LINES

A. FROM A POINT AT AN ANGLE TO THE X-AXIS

XII LETTERING

A. INTRODUCTION
   1. ALPHAP
   2. TITLE
   3. LITERALS

XIII ARC

A. INTRODUCTION
   1. BETWEEN TWO POINTS

XIV MACRO

A. INTRODUCTION
   1. MACRO/
   2. TERMAC/
   3. DEFINE PARAMETERS OF A MACRO
   4. CALL

XV DIMENSIONING

A. INTRODUCTION
   1. DIMST
   2. DIMP
   3. MASK

        4. DIM

XVI LINES

- A. DISTANCE FROM PPP
- B. INTERSECTION OF A LINE AND A CIRCLE

XVII CIRCLES

- A. CENTER AND RADIUS OF AN ARC
- B. DEFINED BY THREE POINTS

XVIII ARC

- A. FILLETING

XIX GEOMETRIC FUNCTIONS

- A. DXOF
- B. DYOF
- C. DIST
- D. ATAND
- E. PARAM

XX HATCHING

XXI LOOPING

XXII ARITHMETIC FUCTIONS

- A. INTRODUCTION
  - 1. SIND
  - 2. COSD
  - 3. ATAND
  - 4. SQRT
  - 5. ABS
  - 6. ALOG

1967 SUMMER INSTITUTE

SUBJECT MATERIAL-NUMERIC CONTROL ✓

I HISTORY AND DEVELOPMENT

- A. CONCEPTION
- B. DEVELOPMENT
- C. SIMPLIFICATION

II PRESENT APPLICATIONS OF NUMERIC CONTROL

- A. PROCESS CONTROLS
- B. APPLICATION TO MACHINE TOOLS

III MANUAL PROGRAMMING

- A. CODE AND LANGUAGE
- B. POINT TO POINT PROGRAMMING
- C. CONTINUOUS PATH PROGRAMMING

IV LABORATORY WORK

- A. PROBLEM USING POINT TO POINT PROGRAMMING-PRATT AND WHITNEY TAPEOMATIC DRILL
- B. DEMONSTRATION OF CONTINUOUS PATH MILLING OPERATIONS-COMPUDYNE 3 AXIS CONTINUOUS PATH MILLING MACHINE

SUBJECT MATERIAL-THE COMPUTERS ROLE IN NUMERICAL CONTROL

V INTRODUCTION

- A. THE PART PROGRAMMER
- B. PROGRAMMING FOR POINT TO POINT POSITIONING
- C. PROGRAMMING FOR CONTOUR MACHINING
- D. PROGRAM CHECKING-TAPE VERIFICATION
- E. PROGRAMMING LANGUAGE
- F. DESIGN AUTOMATION

VI INFORMATION PROCESSING AND STORAGE

VII THE AUTOSPOT II SYSTEM

- A. GENERAL APPLICATION DESCRIPTION
  - 1. SAMPLE PROGRAM
  - 2. THE AUTOSPOT II LANGUAGE
  - 3. VOCABULARY AND STATEMENTS
  - 4. PROCESSOR ORGANIZATION
- B. POINT TO POINT AUTOSPOT II PROGRAMMING
  - 1. DEFINITION STATEMENTS
  - 2. MACHING STATEMENTS
  - 3. SPECIAL STATEMENTS
  - 4. PUNCTUATION
  - 5. OPERATIONS

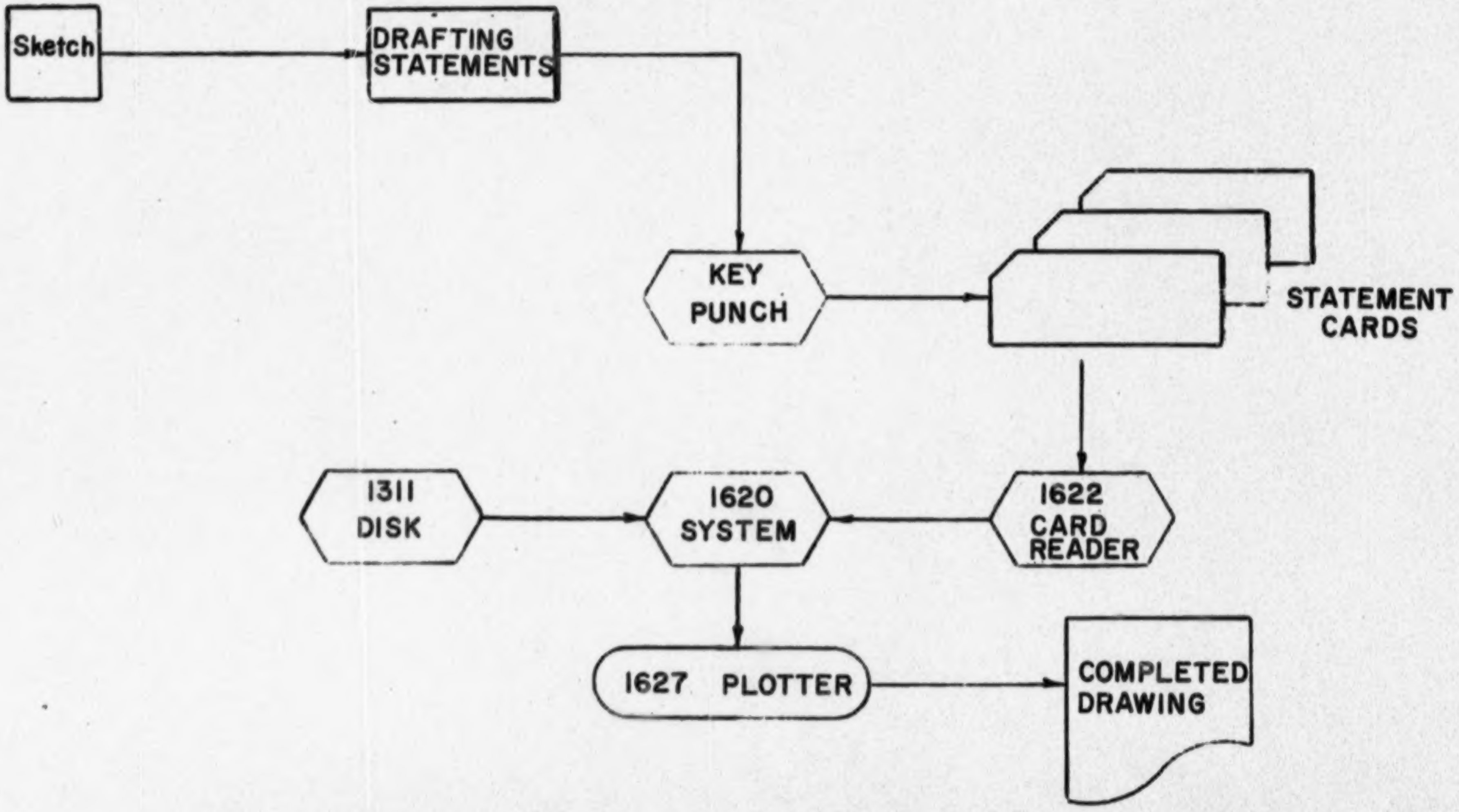
6. PATTERNS
7. ROUTINES

C. NUMERIC CONTROL LABORATORY
1. PROCESSOR OPERATION
2. TOOL OPERATION

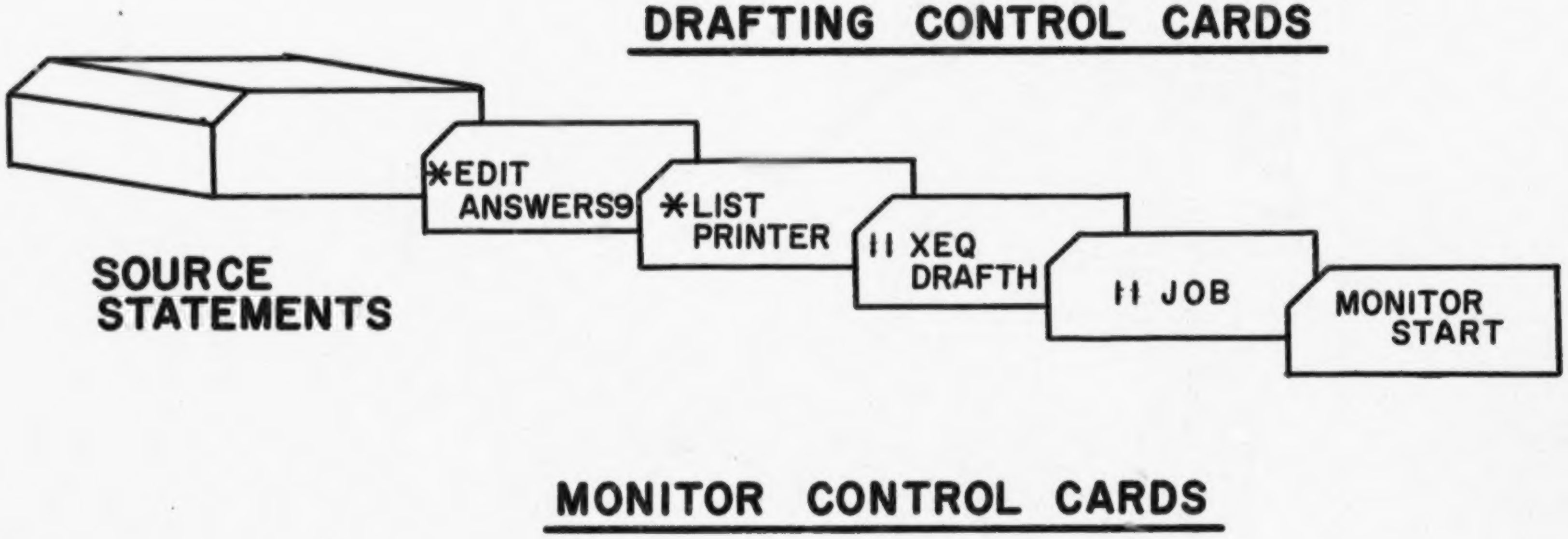
1967 SUMMER INSTITUTE

SUBJECT MATERIAL FOR THE COORDINATE GEOMETRY LANGUAGE

- I PURPOSE
- II COORDINATE TABLE
- III ACCURACY
- IV CODING INSTRUCTIONS
  - A. COMMAND NAME
  - B. DATA
  - C. DITTO FEATURE
  - D. COMMENTS
- V LANGUAGE CONVENTIONS
  - A. ANGLES AND AZIMUTHS
  - B. BEARINGS
  - C. MEASUREMENT OF ANGLES
- VI NON-COMPUTATIONAL INSTRUCTIONS
  - A. CLEAR
  - B. STORE
  - C. DUMP
  - D. PAUSE
- VII INSTRUCTIONS
  - A. LOCATE
  - B. INVERSE
  - C. ANGLE
  - D. DISTANCE
  - E. PARALLEL/LINE
  - F. INTERSECT
  - G. AREA
    - 1. POLYGON
    - 2. SEGMENTS
- VIII TRIANGULATION
- IX TRAVERSE ADJUSTMENT
- X ARC
- XI TANGENT
- XII CURVES
  - A. ALIGNMENT
  - B. OFFSETS
- XIII DIVIDING LINE
- XIV GIRDER LENGTHS


Sketch
DRAFTING STATEMENTS
KEY PUNCH
STATEMENT CARDS
1311 DISK
1620 SYSTEM
1622 CARD READER
1627 PLOTTER
COMPLETED DRAWING

PROCEDURE FOR PRODUCING A DRAWING


DRAFTING CONTROL CARDS
SOURCE STATEMENTS
*EDIT ANSWERS9
*LIST PRINTER
// XEQ DRAFTH
// JOB
MONITOR START
MONITOR CONTROL CARDS

STACKED JOB INPUT

DRAFTING LANGUAGE

1967 SUMMER INSTITUTE
MIAMI-DADE JUNIOR COLLEGE
DRAFTING LANGUAGE

Exercise 1

Draw Sketch 1 using the following specifications:

1. Paper Size 8½ x 11,
2. Thick border ½ inch from the paper edge except on the left which shall have a 1½ inch border,
3. A 3/4 inch title block on the bottom with the note 'INTRODUCTION TO LINES',
4. Place the note, 'PLATE 1' in the lower right corner above the title block,
5. When writing the program use the mirror geometric function,
6. Place the Part Origin at 4.75 and 6.00.

Exercise 2

Draw Sketch 2 using the paper size and border as given in Exercise 1 and include the following specifications:

1. In the title block write the note, 'INTRODUCTION TO CIRCLES',
2. Write the note, 'PLATE 2'.

Exercise 3

Exercise 3 is a demonstration of writing notes using the Drafting Language.

Exercise 4

Draw Sketch 4 using the paper size and border as given in Exercise 1 and include the following specifications:

1. Scale = 2,
2. Title, 'PICTURE AND FRAME'.

Exercise 5

Draw Sketch 5 using the paper size and border as given in Exercise 1 and include the following specifications:

1. The paper and part origin are at the same point,
2. Draw the plate so that the part is along the X-axis,
3. Do not draw the slot,
4. Note that distance KA is unknown,
5. Title, 'SHEAR PLATE'.

Exercise 6

Draw Sketch 6 using the paper size and border as given in Exercise 1 and include the following specifications:

1. Scale = 3/4
2. Origin, 4.75, 6,
3. Draw the object lines of the base only,
4. Title, 'FIXTURE BASE'.

Exercise 7

Draw Sketch 7 as a Macro for a 8½ x 11 sheet of paper using the following specifications:

1. The title will always be on the bottom,
2. The X axis is either the short or long dimension of the paper,
3. The border is a thick line.

NOTE: ALL EXERCISES SHALL BE DRAWN USING THIS MACRO.

Exercise 8

Draw Sketch 8 using the Macro developed in Exercise 7 using the following specifications:

1. Scale = 2,
2. Origin, 2.5, 4, lower left corner of part;
3. Dimension all object lines and notice that one line has an unknown dimension.

Exercise 9

Use Plate 5 as a base and add the following specifications to draw Plate 9:

1. Draw the slot and center lines,
2. Dimension the arcs KJH, JHG, HGF and GFE.

Exercise 10

Use Plate 6 as a base and add the following specifications to draw Plate 10:

1. Draw the slot and center lines,
2. Draw the circles,
3. Dimension the slot width and height,
4. Dimension the base height and vertical dimension between large circles.

Exercise 11

Draw Sketch 11 using the following specifications:

1. Origin, 4.75, 6 at center of gasket,
2. Dimension one of the six holes, the 7/8" radius,
3. Dimension the angles between the three holes at the bottom.

Exercise 12

Draw Sketch 12 using the following specifications:

1. Use the EDIT ANSWERS9 control card to determine the unknown distance,
2. Use the COSD and SIND arithmetic functions for solving the unknown height,
3. Side view origin, 2.25, 2.25, lower left corner,
4. Front view origin 17., 2.25, lower left corner,
5. Draw the plate so that the part is along the X-axis,
6. Dimension the base of the side view,
7. Dimension the X-component of the slot and dove-tail slot of the front view.

Exercise 13

Draw Sketch 13 using the following specifications:

1. Top view origin, 2.312 + 11/8, 8., center of circle,
2. Front view origin, 4.687 + 11/8, 4.125, center of circle,
3. Dimension the X-component of the top arc and hidden lines,
4. Dimension the height in both views.

Exercise 14

Draw Sketch 14 using the following specifications:

1. Scale = .5,
2. Origin, 6.25, 5.5, center of large circle,
3. Dimension the object lines of the side view,
4. Dimension the distance between the circle centers in the front view.

Exercise 15

Draw Sketch 15 using the following specifications:

1. Scale = .5
2. Front view origin, 4.50, 3 11/16,
3. Dimension the following dimensions on the front view; 9/16" vertical, 1 3/8", 1 7/8", and 1 1/8",
4. NOTER Statement in top view Arcs in this slot are 3/8", and the distance between centers is 1.5".

Exercise 16

Draw Sketch 16 using the following specifications:

1. Top view origin, 3.00, 2.1875, low left corner,
2. Side view origin, 7 13/16, 3 3/4, center of circle,
3. Dimension 7/16" on side view,
4. NOTE Statement in top view, "9/32 Drill, CSK 82° x 1/2 DIA.", with the letters at an angle of -15°,
5. NOTER Statements in side view, "1/4 Drill, Bore 1/2 DIA. x 1 7/8 DP" and "5/8 R",
6. Note Statement for Finish Mark,
7. Draws part parallel to X-axis.

Exercise 17

Draw Sketch 17 using the following specifications:

1. Top view origin, 3.75, 5.875, center of cap, all views,
2. Draw cutting plane in top view and section view with hatching,
3. Dimension 2" and 11/16" in section view.

Exercise 18

Draw Sketch 18 using the following specifications:

1. Top view origin, 4.25, 3.75, center of shaft guide,
2. Draw cutting plans in top view and section view with hatching.

Exercise 19

Demonstration

Exercise 20

Draw Sketch 20 using the following specifications:

1. Write a macro to draw the coordinate axis with the following parameters;
   A. Length of X-axis,
   B. Length of Y-axis,
   C. Scale for the X-axis,
   D. Scale for the Y-axis,
2. Write a macro to draw a bar graph with the following parameters:
   A. Center of the bar on the X-axis,
   B. Bar width and height,
   C. Type of latching,
   D. Y value as a literal,
   E. Front of the literal,
   F. Number of letters in the literal.

Exercise 21

Draw Sketch 21 using the following specifications:

1. Origin, 8.70, 6.5, same origin as shown on the sketch,
2. Dimension the arc centers of the depressions and the length of the part.

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NUMERICAL CONTROL

Exercise 1

Write a program in machine language for the Pratt-Whitney Tape-o-matic Drilling and Boring Machine to drill the holes as shown in the Autospot Sketch.

Exercise 2

Create the paper tape for the program written in Exercise 1 and execute the program on the Pratt-Whitney Tape-o-matic Drilling and Boring Machine.

Exercise 3

Write a program in Autospot II Language and create the paper tape to drill the holes shown in the Autospot Sketch.

CODED BY B.L.D. DATE July 1967 SHEET 1 OF 1

1620 DRAFTING SYSTEM

MIAMI-DADE JUNIOR COLLEGE

77 80 IDENTIFICATION

$ | $ FOR COMMENT

STA. NO. | LABEL | = | LINE CLASS | , | MAJOR WORD | PHRASE | SEQ.

```
  ALABEL =              /AN EXAMPLE OF A LABEL
  A12345 =              /FIRST LETTER MUST BE A LETTER (A-Z)
  A      =              /LABELS ARE 1-6 CHARACTERS IN LENGTH

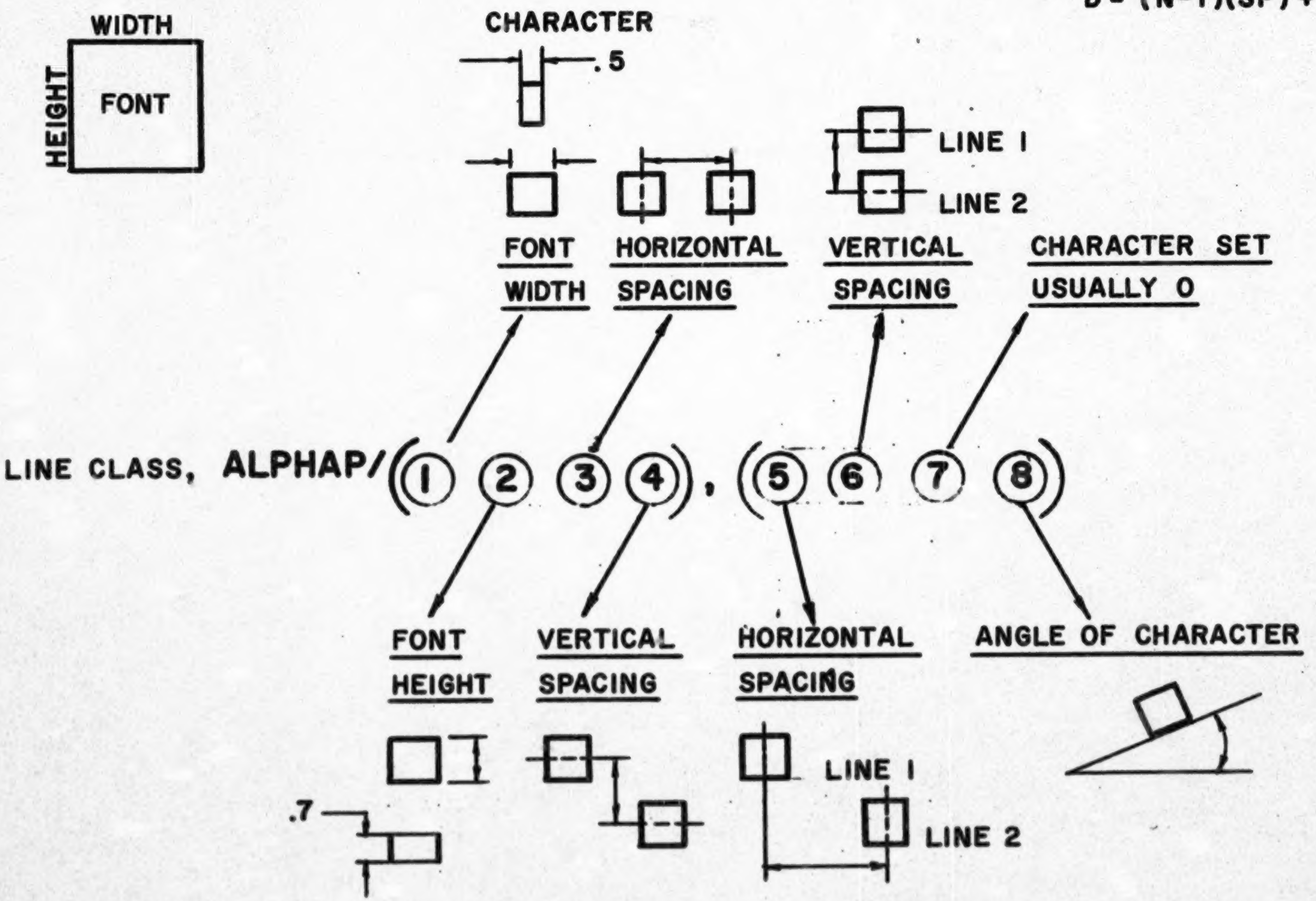
           CTRLN ,       AN EXAMPLE OF A LINE CLASS

                   LINE /AN EXAMPLE OF A MAJOR WORD

                   POINT /-123456.78,1  AN EXAMPLE OF NUMBERS
                                   NUMBERS CAN BE UP TO 8 DIGITS
                                   THE DECIMAL POINT IS OPTIONAL
                                   NEGATIVE NUMBERS MUST BE SIGNED
                          @A LITERAL@ 1-48 CHARACTERS
                                        @ NOT PART OF LITERAL
$$    USED TO PLACE COMMENTS AMONG THE PROGRAM STATEMENTS
1)                        AN EXAMPLE OF A NUMBERED STATEMENT
                   A R C / BLANKS ARE IGNORED BY THE PROCESSOR
```

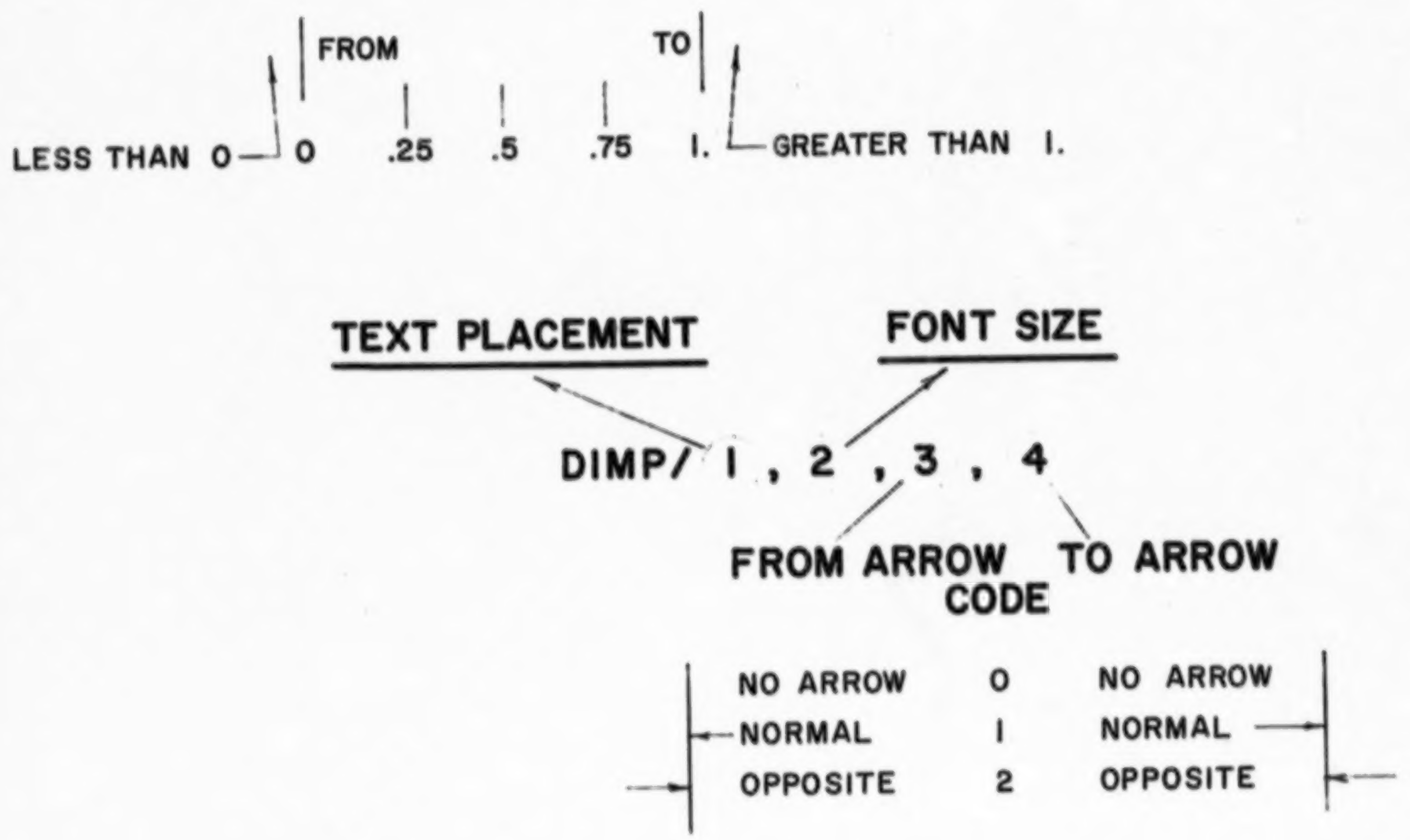
THIS FORM IS FOR PROGRAMMING CONVENIENCE - THE DRAFTING LANGUAGE MAY BE WRITTEN IN FREE FORMAT.

$D = (N-1)(SP) + F/2$


WIDTH
HEIGHT
FONT
CHARACTER
.5
LINE 1
LINE 2
FONT WIDTH
HORIZONTAL SPACING
VERTICAL SPACING
CHARACTER SET USUALLY 0
LINE CLASS, ALPHAP/(① ② ③ ④), (⑤ ⑥ ⑦ ⑧)
FONT HEIGHT
VERTICAL SPACING
HORIZONTAL SPACING
ANGLE OF CHARACTER
.7
LINE 1
LINE 2

ALPHAMERIC PARAMETERS

B.L.D.



FROM
TO
LESS THAN 0
0
.25
.5
.75
1.
GREATER THAN 1.

TEXT PLACEMENT

FONT SIZE

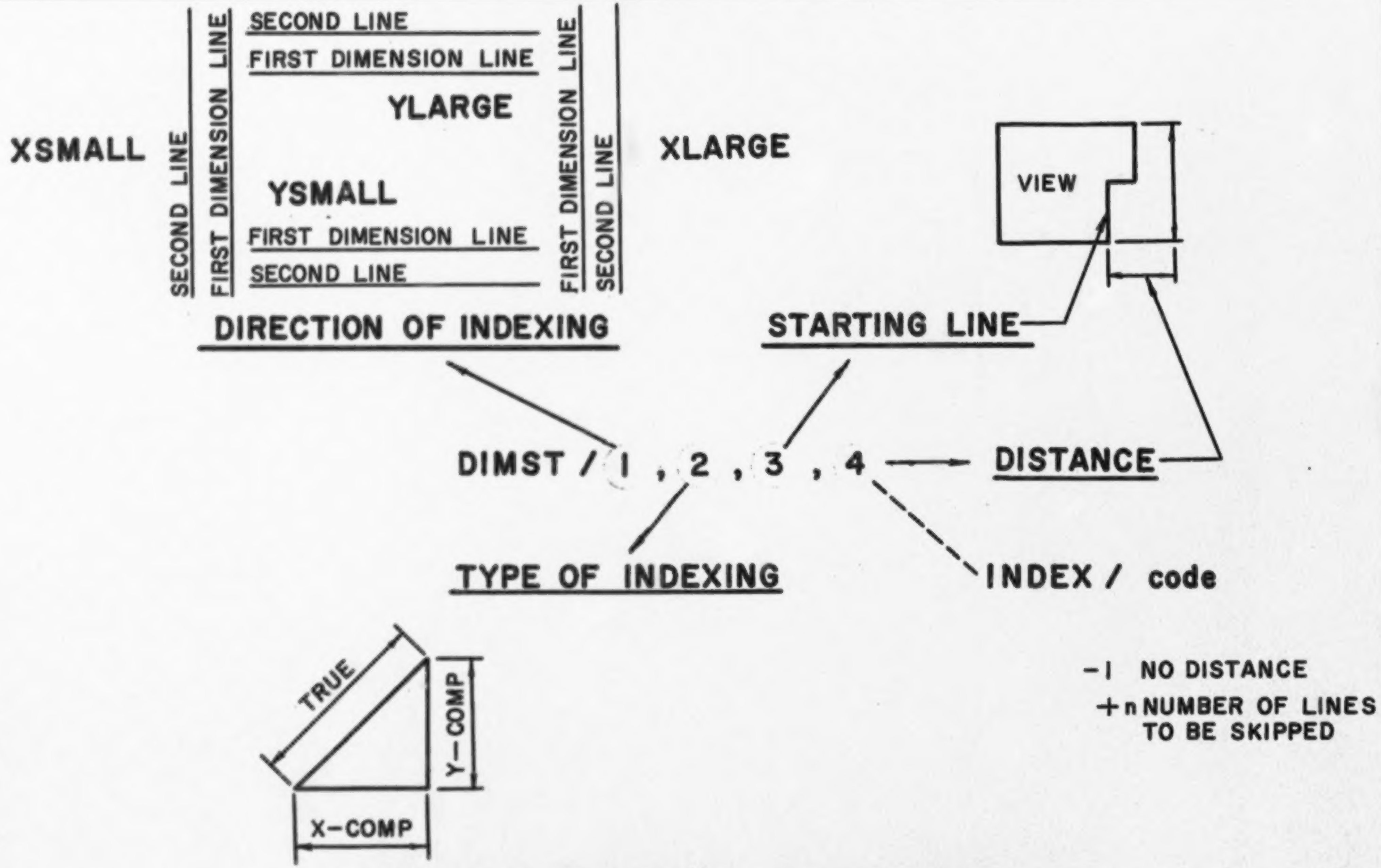
DIMP/ 1 , 2 , 3 , 4

FROM ARROW

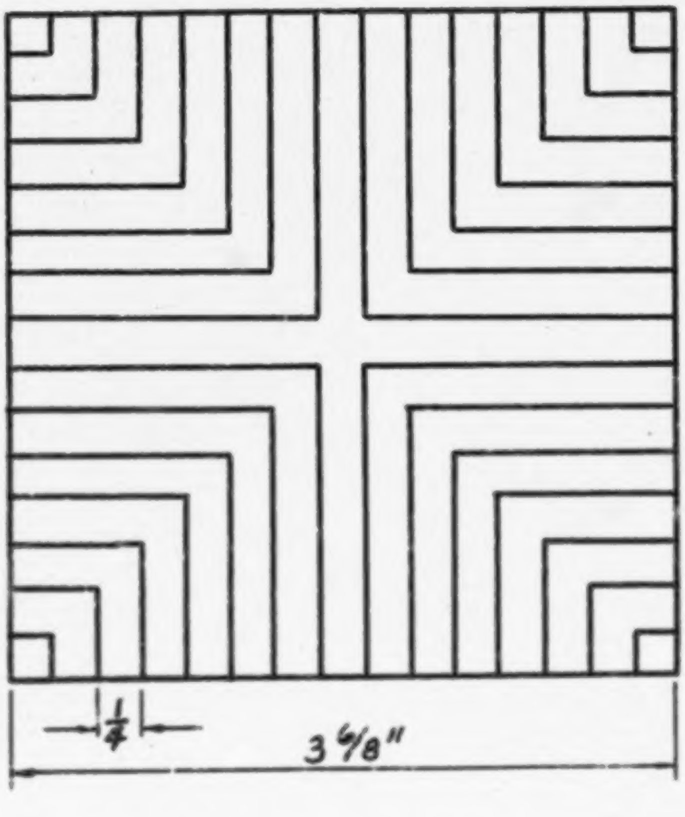
TO ARROW

FROM ARROW	CODE	TO ARROW
NO ARROW	0	NO ARROW
NORMAL	1	NORMAL
OPPOSITE	2	OPPOSITE

DIMP STATEMENT


SECOND LINE
FIRST DIMENSION LINE
YLARGE
XSMALL
SECOND LINE
FIRST DIMENSION LINE
YSMALL
FIRST DIMENSION LINE
SECOND LINE
FIRST DIMENSION LINE
SECOND LINE
XLARGE
VIEW
DIRECTION OF INDEXING
STARTING LINE
DIMST / 1 , 2 , 3 , 4
DISTANCE
TYPE OF INDEXING
INDEX / code
TRUE
Y—COMP
X—COMP
-1 NO DISTANCE
+n NUMBER OF LINES TO BE SKIPPED

DIMST AND INDEX STATEMENTS



SKETCH I

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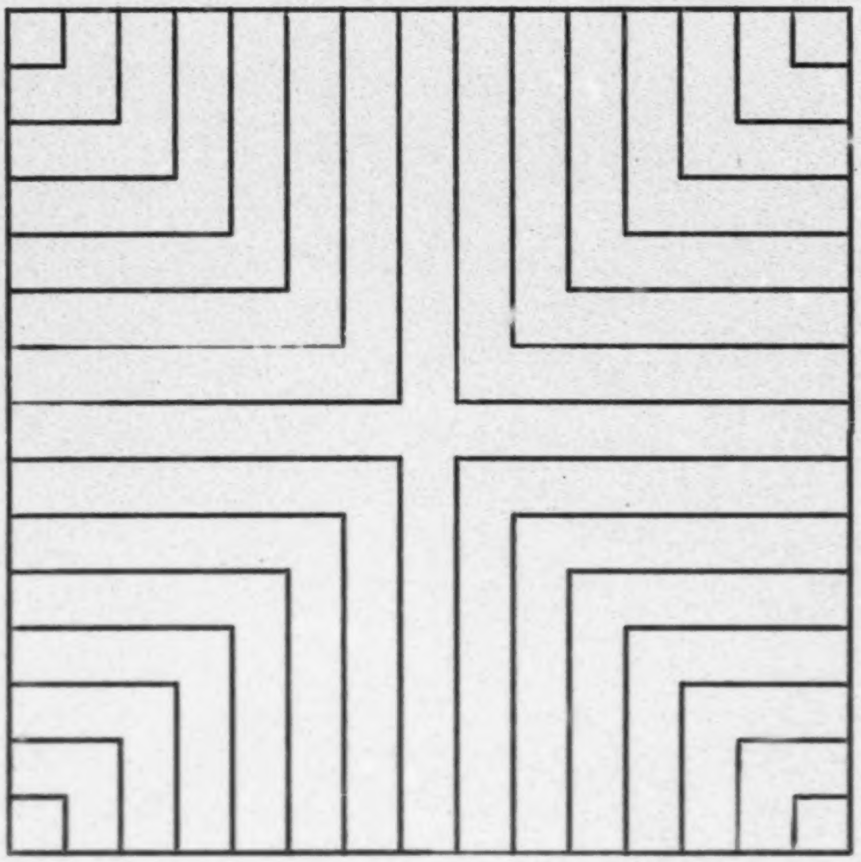

PLATE 1

INTRODUCTION TO LINES

```
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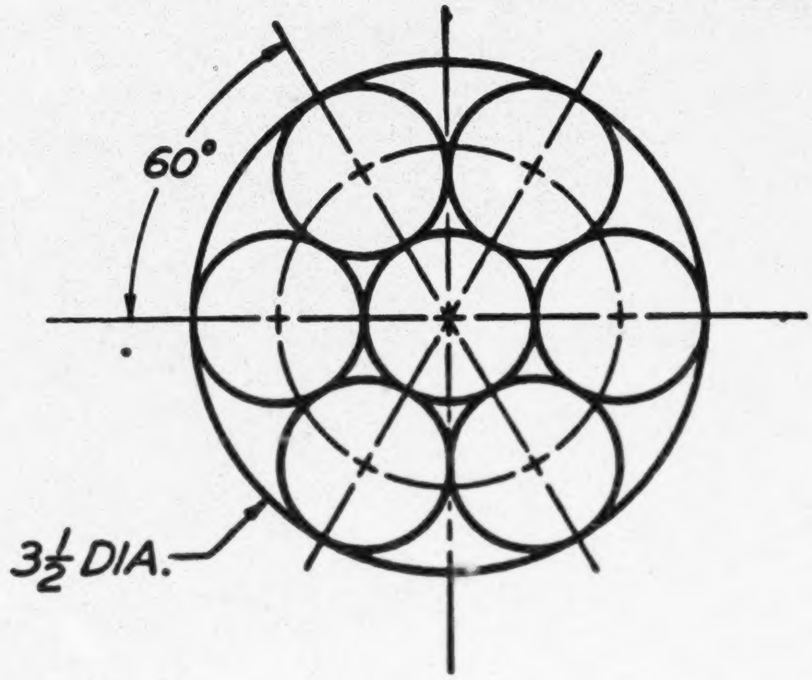
$$  PLATE 1           INTRODUCTION TO LINES
  BOX      =THICK ,VIEW  /
                       LINE  /1.5,.5,DX,6.5
                       LINE  /DY,10
                       LINE  /DX,-6.5
                       LINE  /DY,-10
                       LINE  /1.5,1.25,DX,6.5
                       END   /BOX
                       DRAW  /BOX
                       ALPHAP/(.2,.3,.282,0),(0,0,0,0)
                       TITLE/1.6,.875,@ INTRODUCTION TO LINES@
                       TITLE /6,1.5,@PLATE  1@
  SQUARE =             VIEW  /
                       ORIGIN/4.75,6
                       LINE  /1+7/8,0,DY,1+7/8
                       LINE  /DX,-1-7/8
                       LINE  /1/8,1+7/8,DY,-1-3/4
                       LINE  /DX,1+3/4
                       LINE  /1+7/8,3/8,DX,-1-1/2
                       LINE  /DY,1+1/2
                       LINE  /5/8,1+7/8,DY,-1-1/4
                       LINE  /DX,1+1/4
                       LINE  /1+7/8,7/8,DX,-1
                       LINE  /DY,1
                       LINE  /1+1/8,1+7/8,DY,-3/4
                       LINE  /DX,3/4
                       LINE  /1+7/8,1+3/8,DX,-1/2
                       LINE  /DY,1/2
                       LINE  /1+5/8,1+7/8,DY,-1/4
                       LINE  /DX,1/4
                       END   /SQUARE
                       DRAW  /SQUARE
                       DRAW  /MIRX(SQUARE)
                       DRAW  /MIRY(SQUARE)
                       DRAW  /MIRXY(SQUARE)
                       FINI  /
```



SKETCH 2

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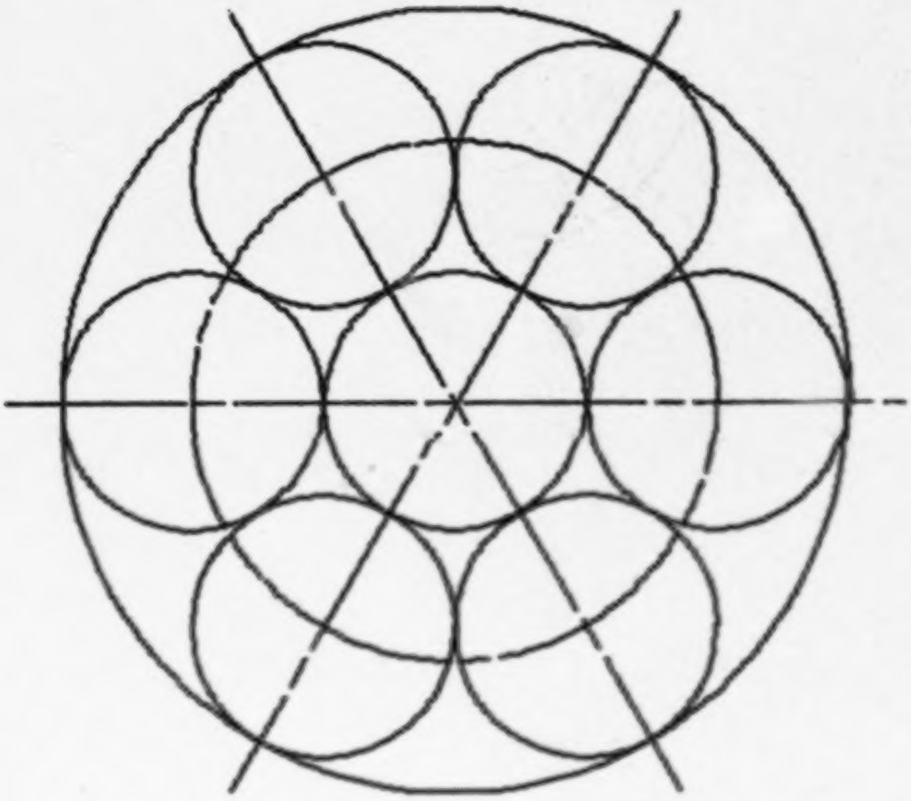

PLATE 2

INTRODUCTION TO CIRCLES

```
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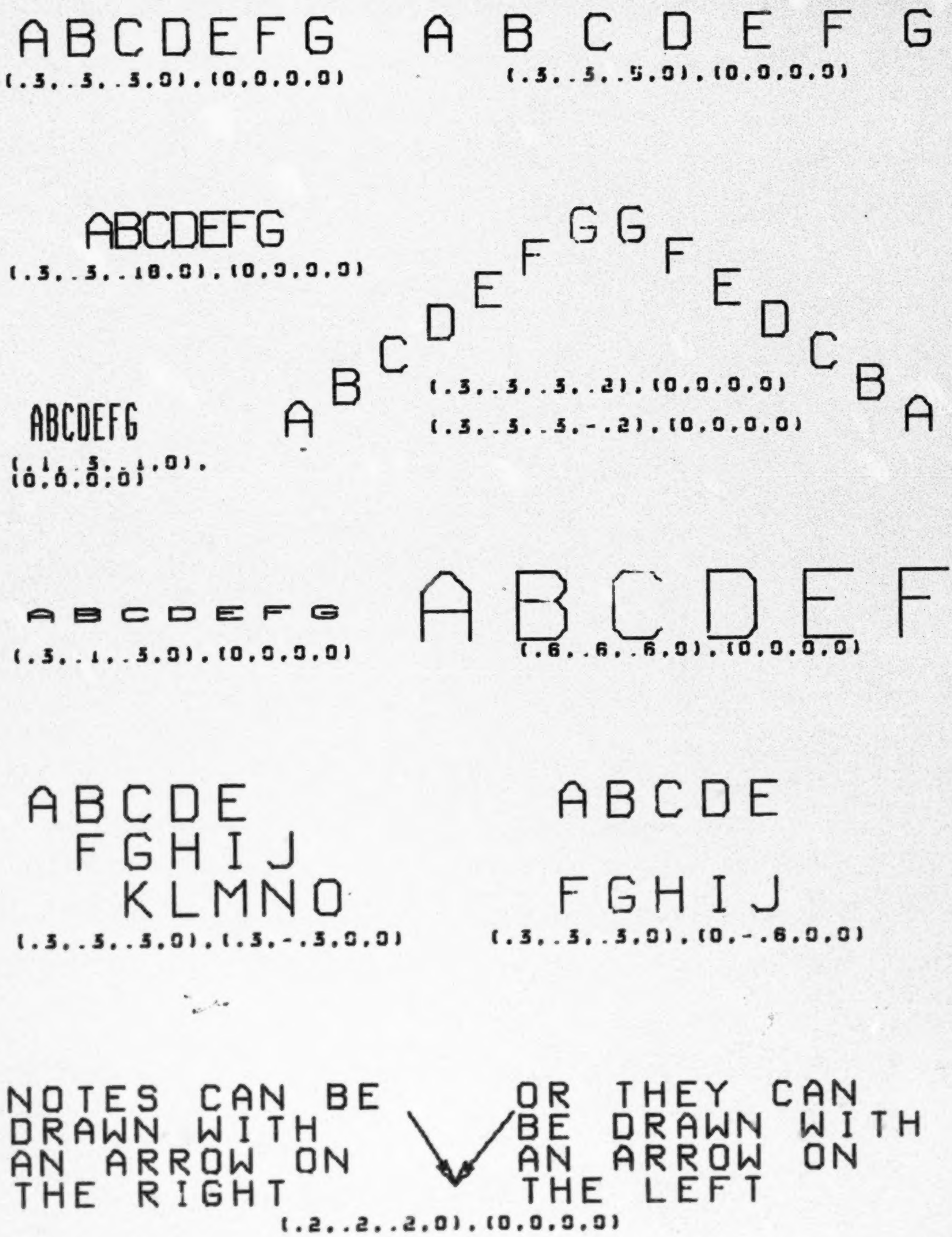
$$  PLATE 2        INTRODUCTION TO CIRCLES
  BOX      =THICK ,VIEW  /
                 LINE  /1.5,.5,DX,6.5
                 LINE  /DY,10
                 LINE  /DX,-6.5
                 LINE  /DY,-10
                 LINE  /1.5,1.25,DX,6.5
                 END   /BOX
                 DRAW  /BOX
                 ALPHAP/(.2,.3,.26,0),(0,0,0,0)
                 TITLE/1.6,.875,@ INTRODUCTION TO CIRCLES@
                 ALPHAP/(.2,.2,.2,0),(0,0,0,0)
                 TITLE /6,1.5,@PLATE  2@
  DESIGN  =      VIEW  /
                 ORIGIN/4.75,6
                 CIRCLE/0,0,1.75
  C1       =CTRLN ,CIRCLE/0,0,1.166
  L1       =CTRLN ,LINE  /-2,0,DX,4
           CONSTR,LINE  /0,0,ATANGL,120,LENGTH,2
  L2       =CTRLN ,LINE  /PPP,ATANGL,300,LENGTH,4
           CONSTR,LINE  /0,0,ATANGL,60,LENGTH,2
  L3       =CTRLN ,LINE  /PPP,ATANGL,240,LENGTH,4
                 CIRCLE/(POINT/XSMALL,INTOF,L1,C1),1.166/2
                 CIRCLE/(POINT/YLARGE,INTOF,L2,C1),1.166/2
                 CIRCLE/(POINT/YLARGE,INTOF,L3,C1),1.166/2
                 CIRCLE/1.166,0,1.166/2
                 CIRCLE/(POINT/YSMALL,INTOF,L2,C1),1.166/2
                 CIRCLE/(POINT/YSMALL,INTOF,L3,C1),1.166/2
                 CIRCLE/0,0,1.166/2
                 END   /DESIGN
                 DRAW  /DESIGN
                 FINI  /
```


ABCDEFG
(.3,.3,.3,0),(0,0,0,0)

A B C D E F G
(.3,.3,.5,0),(0,0,0,0)

ABCDEFG
(.3,.3,.18,0),(0,0,0,0)

ABCDEFG GFEDCBA
(.3,.3,.3,.2),(0,0,0,0)
(.3,.3,.3,-.2),(0,0,0,0)

ABCDEFG
(.1,.3,.1,0),
(0,0,0,0)

ABCDEFG
(.3,.1,.3,0),(0,0,0,0)

ABCDEF
(.6,.6,.6,0),(0,0,0,0)

ABCDE
FGHIJ
KLMNO
(.3,.3,.3,0),(.3,-.3,0,0)

ABCDE

FGHIJ
(.3,.3,.3,0),(0,-.6,0,0)

NOTES CAN BE
DRAWN WITH
AN ARROW ON
THE RIGHT

OR THEY CAN
BE DRAWN WITH
AN ARROW ON
THE LEFT

(.2,.2,.2,0),(0,0,0,0)

PLATE 3

INTRODUCTION TO NOTES

```
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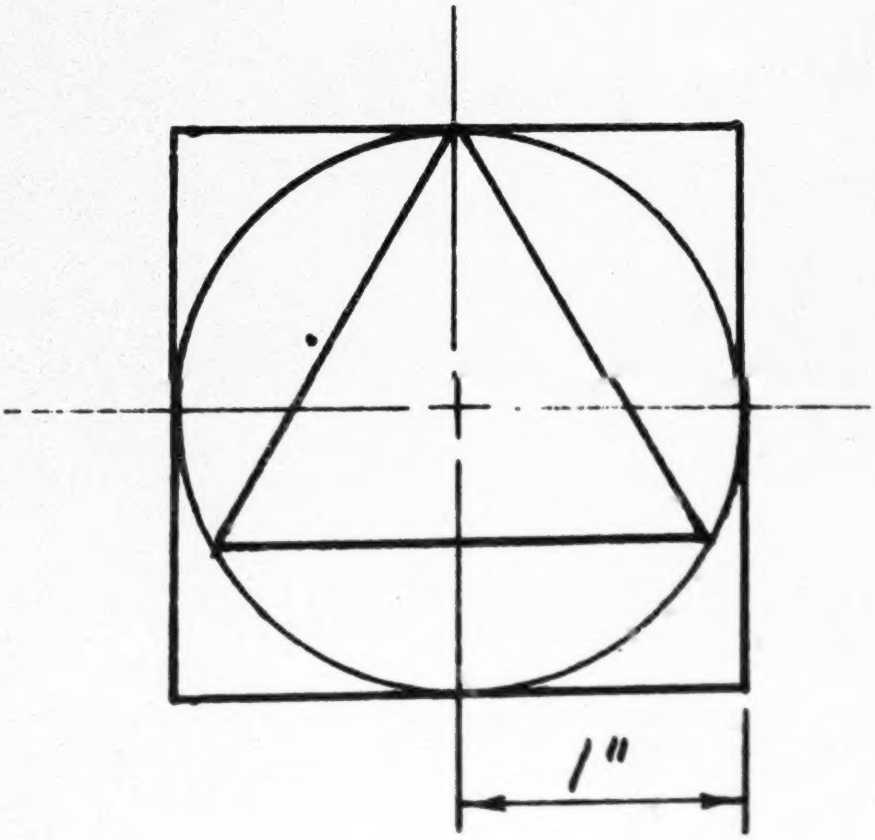
$$  PLATE 3         INTRODUCTION TO NOTES
  BOX     =THICK ,VIEW  /
                   LN    /1.5,.5,DX,6.5
                   LN    /DY,10
                   LN    /DX,-6.5
                   LN    /DY,-10
                   LN    /1.5,1.25,DX,6.5
                   END   /BOX
                   DRAW  /BOX
                   ALPHAP/(.2,.3,.282,0),(0,0,0,0)
                   TITLE /1.5,.875,@ INTRODUCTION TO NOTES@
                   ALPHAP/(.2,.2,.2,0),(0,0,0,0)
                   TITLE/6,1.5,@PLATE  3@
                   ORIGIN/.39,-.225
                   ALPHAP/(.3,.3,.3,0),(0,0,0,0)
                   NOTE  /1.65,10,@ABCDEFG@
                   ALPHAP/(.3,.3,.5,0),(0,0,0,0)
                   NOTE  /4.2,10,@ABCDEFG@
                   NOTE  /2.05,8.8,@ABCDEFG@
                   ALPHAP/(.3,.3,.3,.2),(0,0,0,0)
                   NOTE  /3.3,7.6,@ABCDEFG@
                   ALPHAP/(.3,.3,.3,-.2),(0,0,0,0)
                   NOTE  /5.4,8.8,@GFEDCBA@
                   ALPHAP/(.1,.3,.1,0),(0,0,0,0)
                   NOTE  /1.65,7.6,@ABCDEFG@
                   ALPHAP/(.3,.1,.3,0),(0,0,0,0)
                   NOTE  /1.65,6.4,@ABCDEFG@
                   ALPHAP/(.6,.6,.6,0),(0,0,0,0)
                   NOTE  /4.2,6.4,@ABCDEF@
                   ALPHAP/(.3,.3,.3,0),(.3,-.3,0,0)
                   NOTE  /1.65,5.2,@ABCDE@,@FGHIJ@,@KLMNO@
                   ALPHAP/(.3,.3,.3,0),(0,-.6,0,0)
                   NOTE  /5.0,5.2,@ABCDE@,@FGHIJ@
                   ALPHAP/(.2,.2,.2,0),(0,-.2,0,0)
                   NOTER /4.25,2.8,-.35,.55,@NOTES CAN BE@,$
                   NOTE  /4.25,2.8,.45,.55,@OR THEY CAN@,$
                   @BE DRAWN WITH@,@AN ARROW ON@,@THE LEFT@
                   ALPHAP/(.1,.1,.1,0),(0,0,0,0)
                   NOTE  /1.49,9.75,@(.3,.3,.3,0),(0,0,0,0)@
                   NOTE  /4.65,9.75,@(.3,.3,.5,0),(0,0,0,0)@
                   NOTE  /1.5,8.55,@(.3,.3,.18,0),(0,0,0,0)@
                   NOTE  /4.15,7.8,@(.3,.3,.3,.2),(0,0,0,0)@
                   NOTE  /4.15,7.55,@(.3,.3,.3,-.2),(0,0,0,0)@
                   NOTE  /1.5,7.35,@(.1,.3,.1,0),@
                   NOTE  /1.5,7.25,@(0,0,0,0)@
                   NOTE  /4.7,6.15,@(.6,.6,.6,0),(0,0,0,0)@
                   NOTE  /1.5,6.15,@(.3,.1,.3,0),(0,0,0,0)@
                   NOTE  /1.5,4.35,@(.3,.3,.3,0),(.3,-.3,0,0)@
                   NOTE  /4.5,4.35,@(.3,.3,.3,0),(0,-.6,0,0)@
                   NOTE  /3.15,2.55,@(.2,.2,.2,0),(0,0,0,0)
                   FINI  /
```



SKETCH 4

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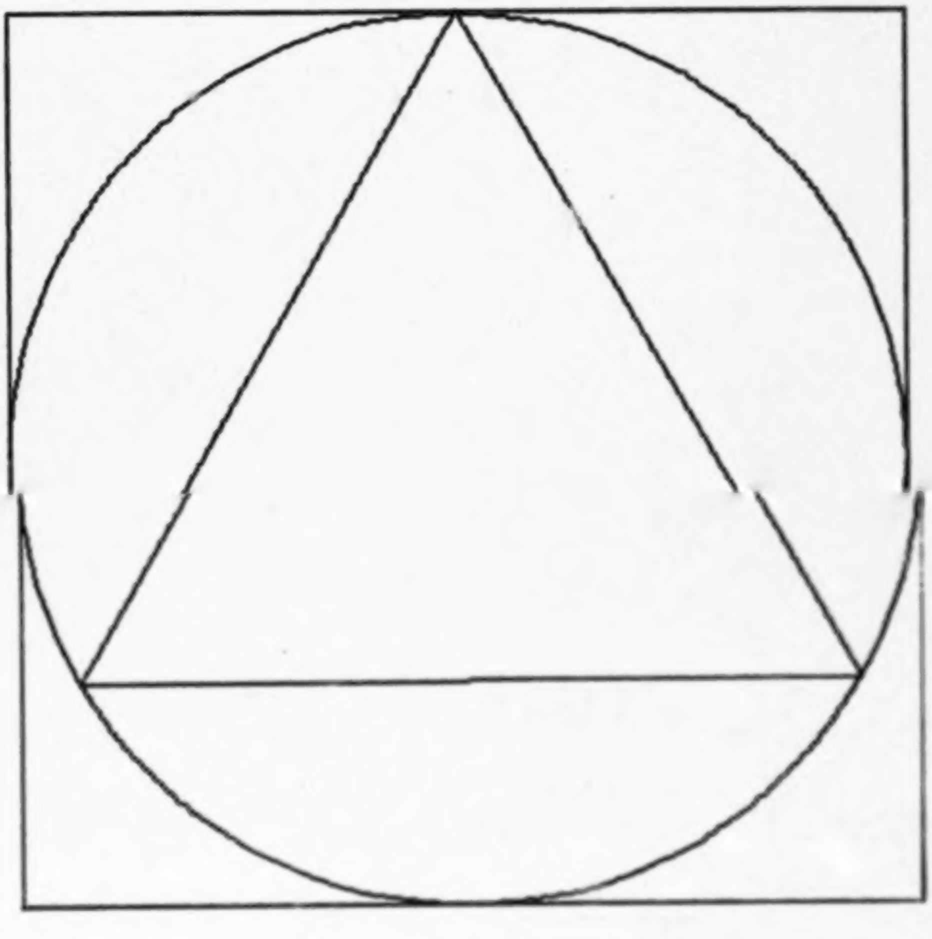

PLATE 4

PICTURE AND FRAME

```
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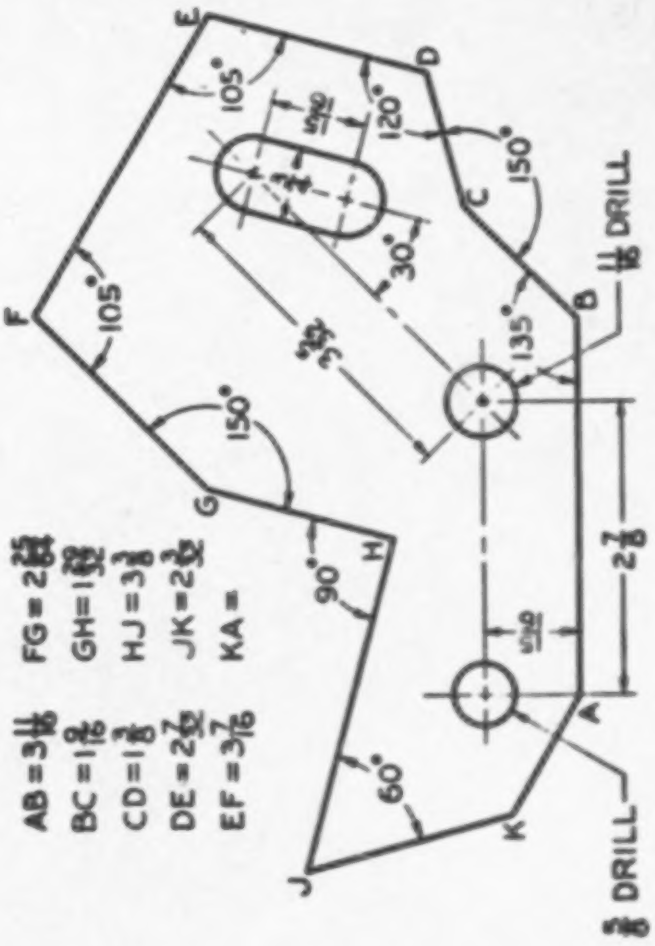
$$  PLATE 4          SQUARE INSCRIBED IN A CIRCLE
  BOX      =THICK ,VIEW  /
                   LN    /1.5,.5,DX,6.5
                   LN    /DY,10
                   LN    /DX,-6.5
                   LN    /DY,-10
                   LN    /1.5,1.25,DX,6.5
                   END   /BOX
                   DRAW  /BOX
                   ALPHAP/(.3,.3,.3,0),(0,0,0,0)
                   TITLE/2.05,.875,a PICTURE AND FRAMEa
                   ALPHAP/(.2,.2,.2,0),(0,0,0,0)
                   TITLE /6,1.5,aPLATE  4a
  PICT     =       VIEW  /
                   ORIGIN/4.75,6
                   SCALE /2
                   LN    /-1,-1,DX,2
                   LN    /DY,2
                   LN    /DX,-2
                   LN    /DY,-2
                   CIRCLE/0,0,1
  P1       =       PT    /0,0,ATANGL,90,LENGTH,1
  P2       =       PT    /0,0,ATANGL,210,LENGTH,1
  P3       =       PT    /0,0,ATANGL,330,LENGTH,1
                   [illegible]
                    LN    /P2,P3
                    LN    /P3,P1
                    END   /PICT
                    DRAW  /PICT
                    FINI  /
```


AB = 3 11/16
BC = 1 9/16
CD = 1 3/8
DE = 2 7/32
EF = 3 7/16
FG = 2 25/64
GH = 1 29/32
HJ = 3 3/8
JK = 2 3/32
KA =
A
B
C
D
E
F
G
H
J
K
105°
105°
150°
150°
120°
135°
90°
60°
30°
3 25/32
3/4
5/16
5/16
2 7/8
11/16 DRILL
5/8 DRILL

SKETCH 5

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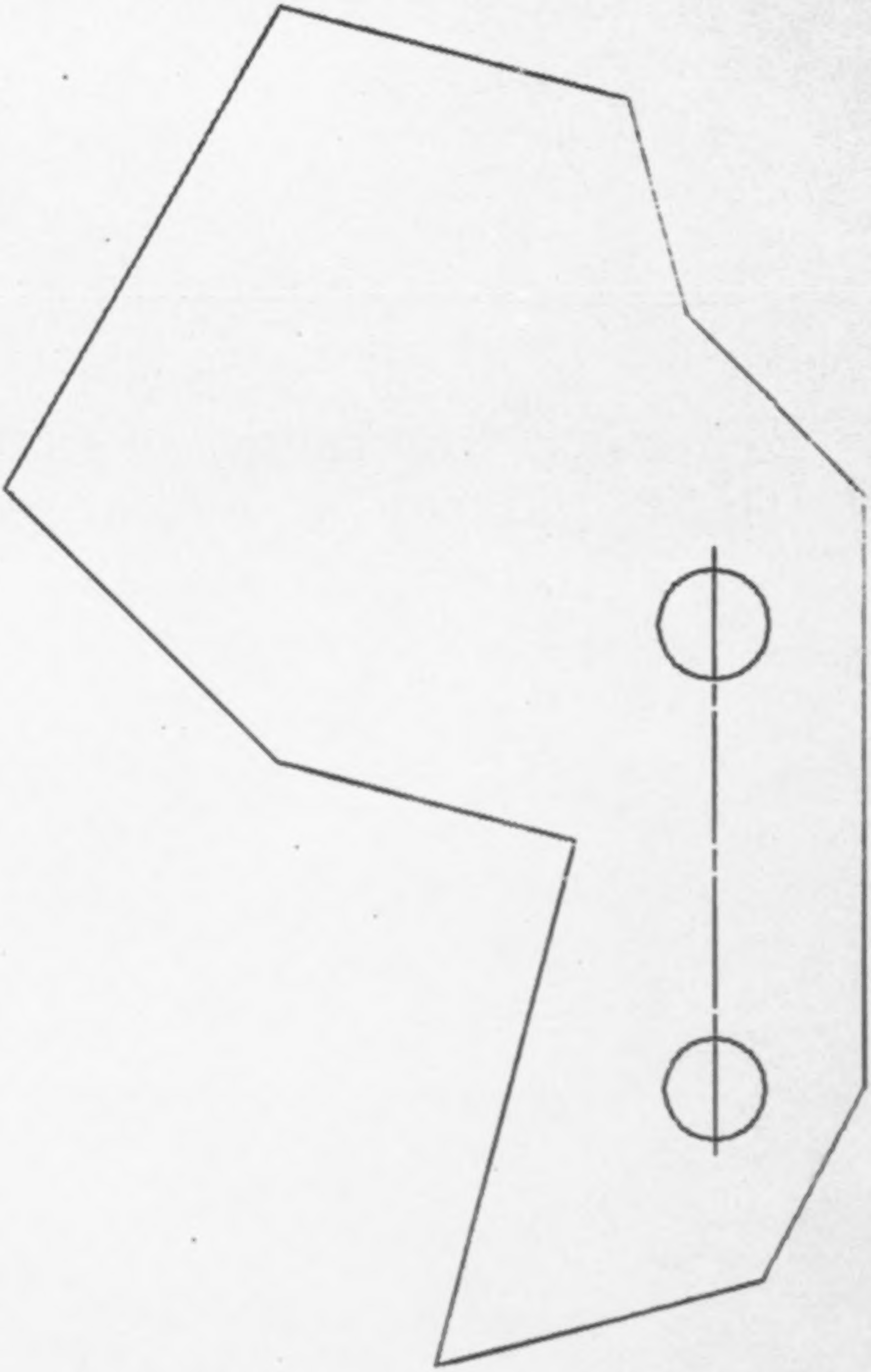

PLATE 5

SHEAR PLATE

```
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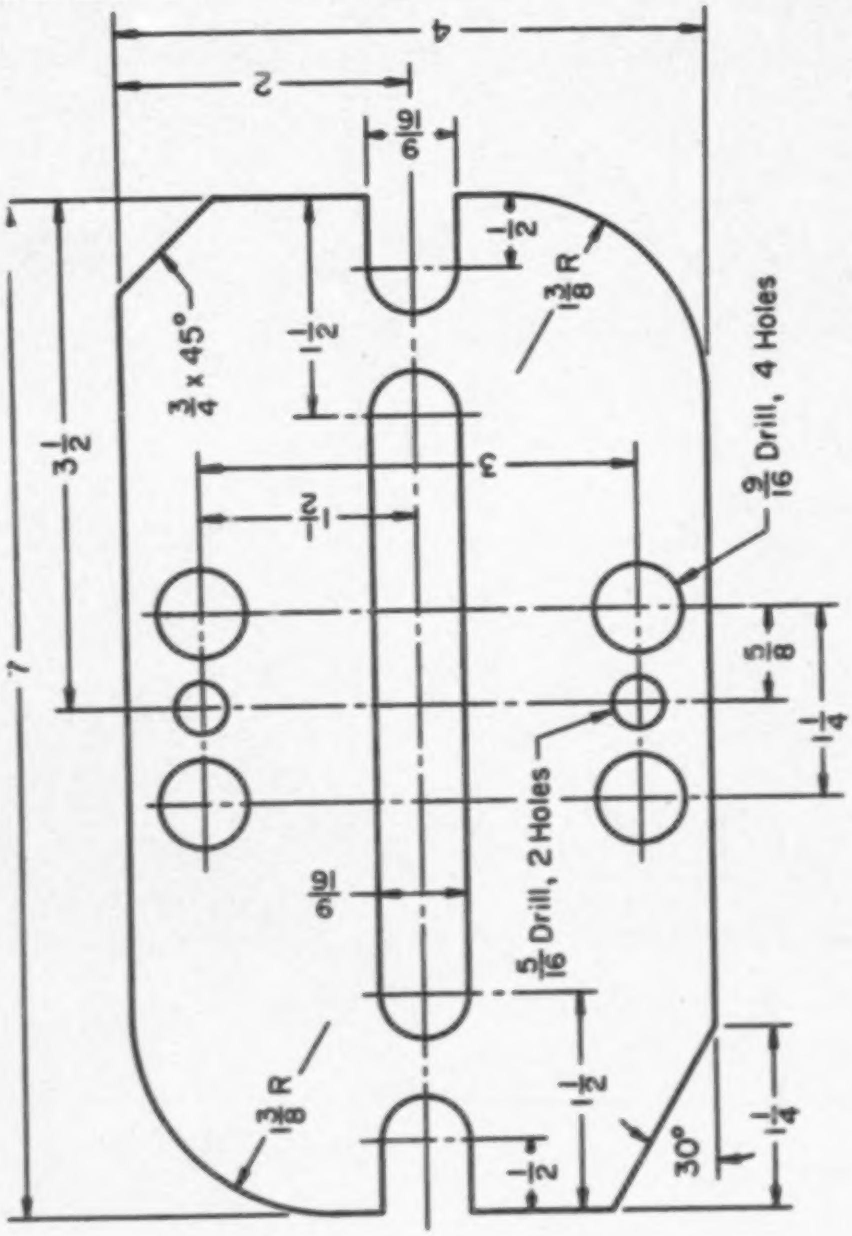
$$  PLATE 5           LINES AT ANGLES TO PART AXIS-SHEAR PLATE  LONG X
  BOX  =THICK,        VIEW/
                      LN     /.5,.5,DX,10
                      LN     /DY,6.5
                      LN     /DX,-10
                      LN     /DY,-6.5
                      LN     /1.25,.5,DY,6.5
                      END/BOX
                      DRAW/BOX
                      ALPHAP/(.5,.5,0,-.5),(0,0,0,270)
                      TITLE /.875,6.8,@ SHEAR PLATE@
                      ALPHAP/(.2,.2,0,-.2),(0,0,0,270)
                      TITLE /1.5,2.5,@PLATE  5@
   PLATE    =         VIEW  /
   A        =         POINT /3.45,1.08
                      LINE  /A,DX,3+11/16
                      LINE  /PPP,ATANGL,45,LENGTH,1+9/16
                      LINE  /PPP,ATANGL,15,LENGTH,1+3/8
                      LINE  /PPP,ATANGL,75,LENGTH,2+7/32
                      LINE  /PPP,ATANGL,150,LENGTH,3+7/16
                      LINE  /PPP,ATANGL,225,LENGTH,2+25/64
                      LINE  /PPP,ATANGL,255,LENGTH,1+29/32
                      LINE  /PPP,ATANGL,165,LENGTH,3+3/8
   P1       =         LINE  /PPP,ATANGL,285,LENGTH,2+3/32
                      LINE  /PPP,A
   KA       =                 DIST((POINT/P1),A)
   P2       =         PT    /A,DY,15/16
                      CR    /P2,5/16
   P3       =         PT    /P2,DX,2+7/8
                      CR    /P3,11/32
                      PT    /DX,.125
              CTRLN,LN      /DX,-3.75
                      END   /PLATE
                      DRAW  /PLATE
                      FINI/
```


4
2
9/16
1/2
1 3/8 R
3/4 x 45°
1 1/2
3
1 1/2
3 1/2
7
9/16 Drill, 4 Holes
5/8
1 1/4
5/16 Drill, 2 Holes
9/16
1 1/2
1/2
1 3/8 R
30°
1 1/4

SKETCH 6

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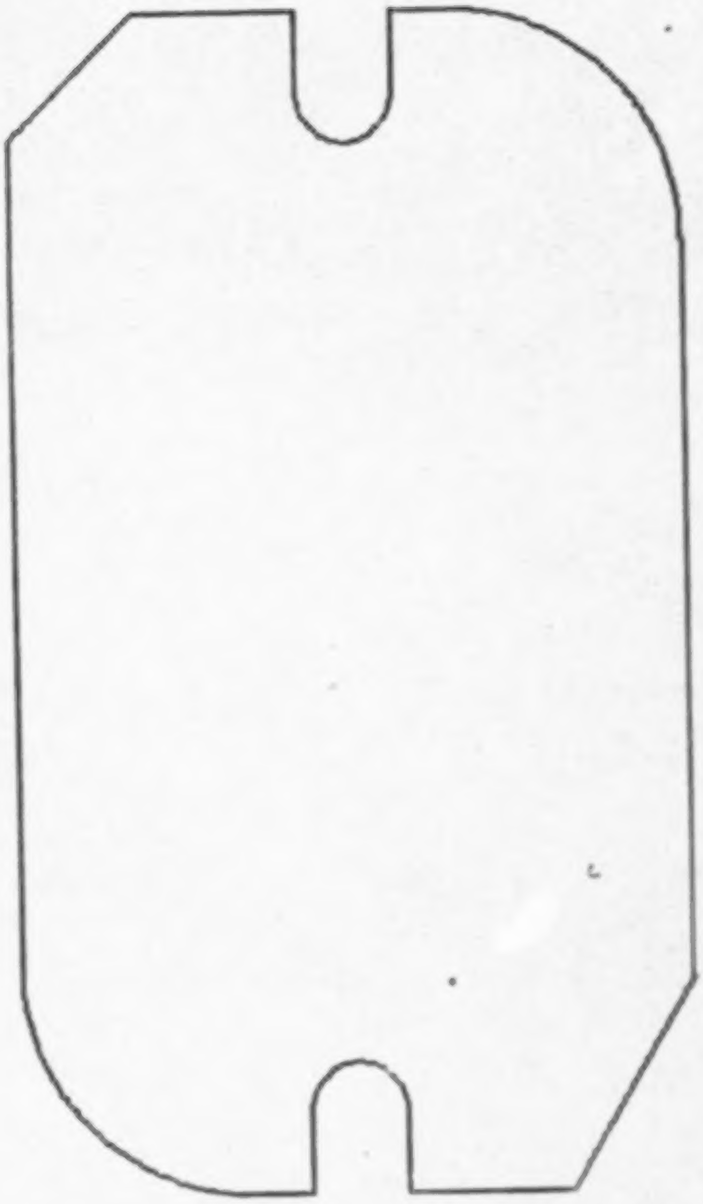

PLATE 6

FIXTURE BASE

```
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$$  PLATE 6        COMBINING ARCS AND LINES-FIXTURE BASE
  BOX      =THICK ,VIEW  /
                  LN     /1.5,.5,DX,6.5
                  LN     /DY,10
                  LN     /DX,-6.5
                  LN     /DY,-10
                  LN     /1.5,1.25,DX,6.5
                  END    /BOX
                  DRAW   /BOX
                  ALPHAP/(.2,.2,.2,0),(0,0,0,0)
                  TITLE/5.5,1.5,@PLATE  6@
                  ALPHAP/(.4,.3,.4,0),(0,0,0,0)
                  TITLE /2.15,.875,@ FIXTURE BASE@
  BASE     =      VIEW  /
                  SCALE /3/4
                  ORIGIN/4.75,6
                  LINE  /2,-2.25,ATANGL,240,TILLY,-3.5
                  LINE  /PPP,ATANGL,180,TILLX,9/32
                  LINE  /DY,.5
                  ARC   /0,-3,9/32,0,180
                  LINE  /PPP,DY,-.5
                  LINE  /DX,-(2-9/32)
                  ARC   /1.375
                  LINE  /DY,6.25
                  LINE  /DX,3/4,DY,3/4
                  LINE  /DX,2-(3/4+9/32)
                  LINE  /DY,-.5
                  ARC   /0,3,9/32,180,180
                  LINE  /DY,.5
                  LINE  /DX,2-9/32
                  ARC   /1.375
                  LINE  /DY,-5.75
                  END   /BASE
                  DRAW  /BASE
                  FINI/
```

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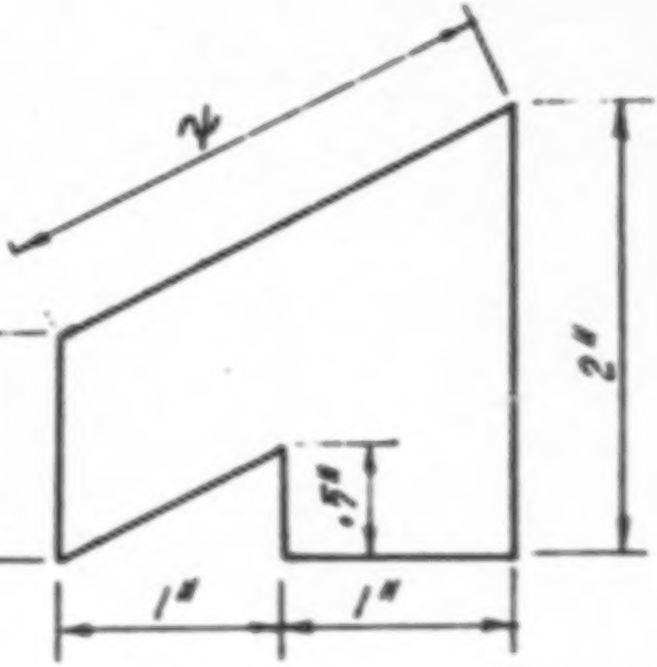

SKETCH 8

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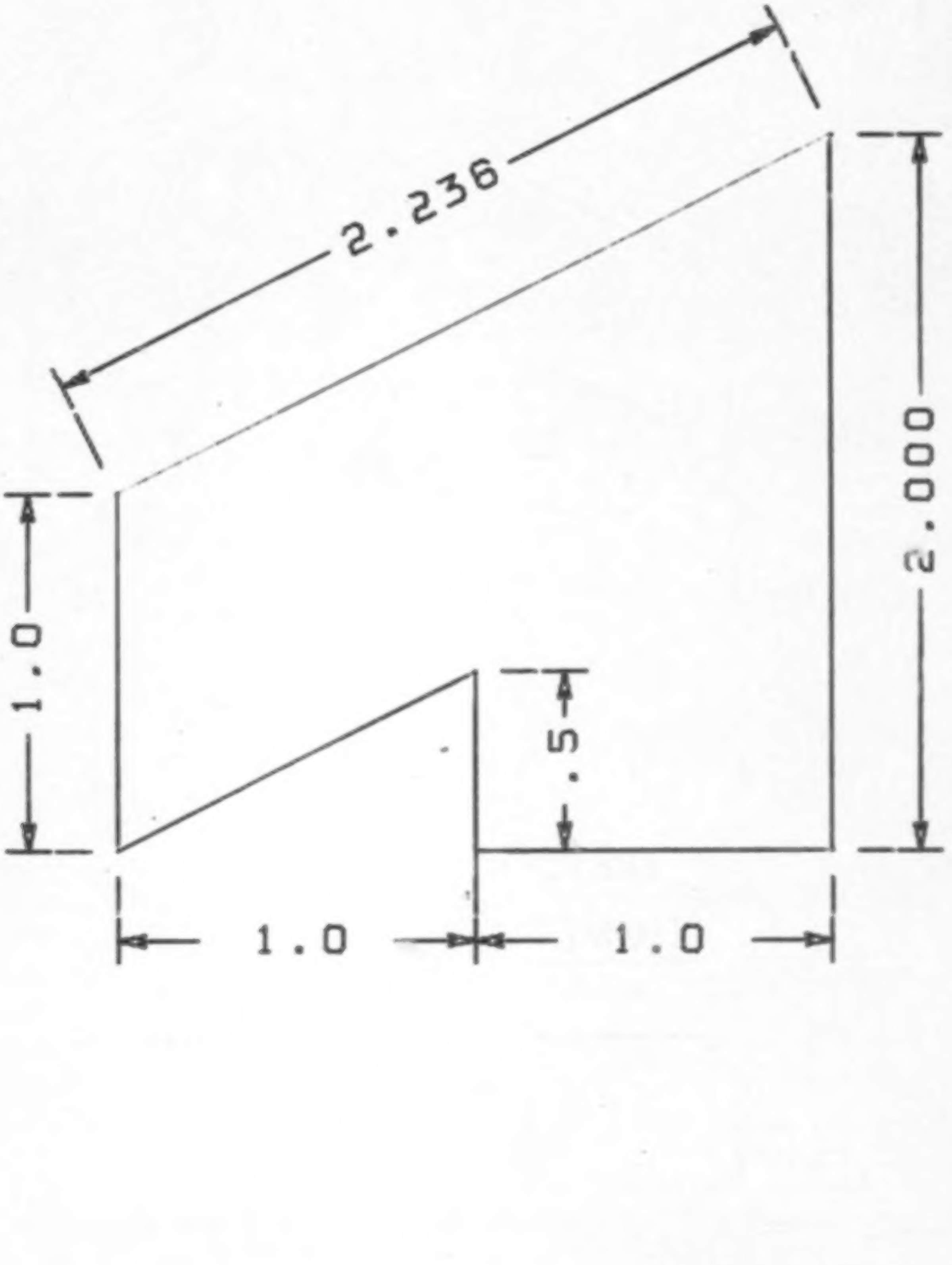
2.236
2.000
1.0
.5
1.0
1.0

PLATE 8

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```
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$$  PLATE 8            DIMENSIONING A PART
  BOX        =         VIEW /
                       CALL  /FRAME1,,X=6.5,,Y=10,,ORX=1.5,,ORY=.5
                       END  /BOX
                       DRAW  /BOX
  ABC        =         VIEW  /
                       SCALE /2
                       ORIGIN/2.5,4
  L1         =         LINE  /DY,1
  L2         =         LINE  /DX,2,DY,1
  L3         =         LINE  /DY,-2
  L4         =         LINE  /DX,-1
  L5         =         LINE  /DY,.5
  L6         =         LINE  /DX,-1,DY,-.5
                       END   /ABC
                       DRAW  /ABC
                       DIMST /XSMALL,YCOMP,L1,.5
                       MASK  /@P,D1@
                       DIM   /L1
                       DIMST /YLARGE,TRUE,L2,.5
                       MASK  /@P,D3@
                       DIMP  /.5,.2,1,1
                       DIM   /L2
                       DIMST /XLARGE,YCOMP,L3,.5
                       DIM   /L3
                       DIMST /YSMALL,XCOMP,L4,.5
                       MASK  /@H,D1@
                       DIM   /L4
                       INDEX /-1
                       DIM   /L6
                       DIMST /XLARGE,YCOMP,L5,.5
                       MASK  /@P,D1@
                       DIM   /L5
                       ALPHAP/(.2,.2,.2,0),(0,0,0,0)
                       FINI  /
```

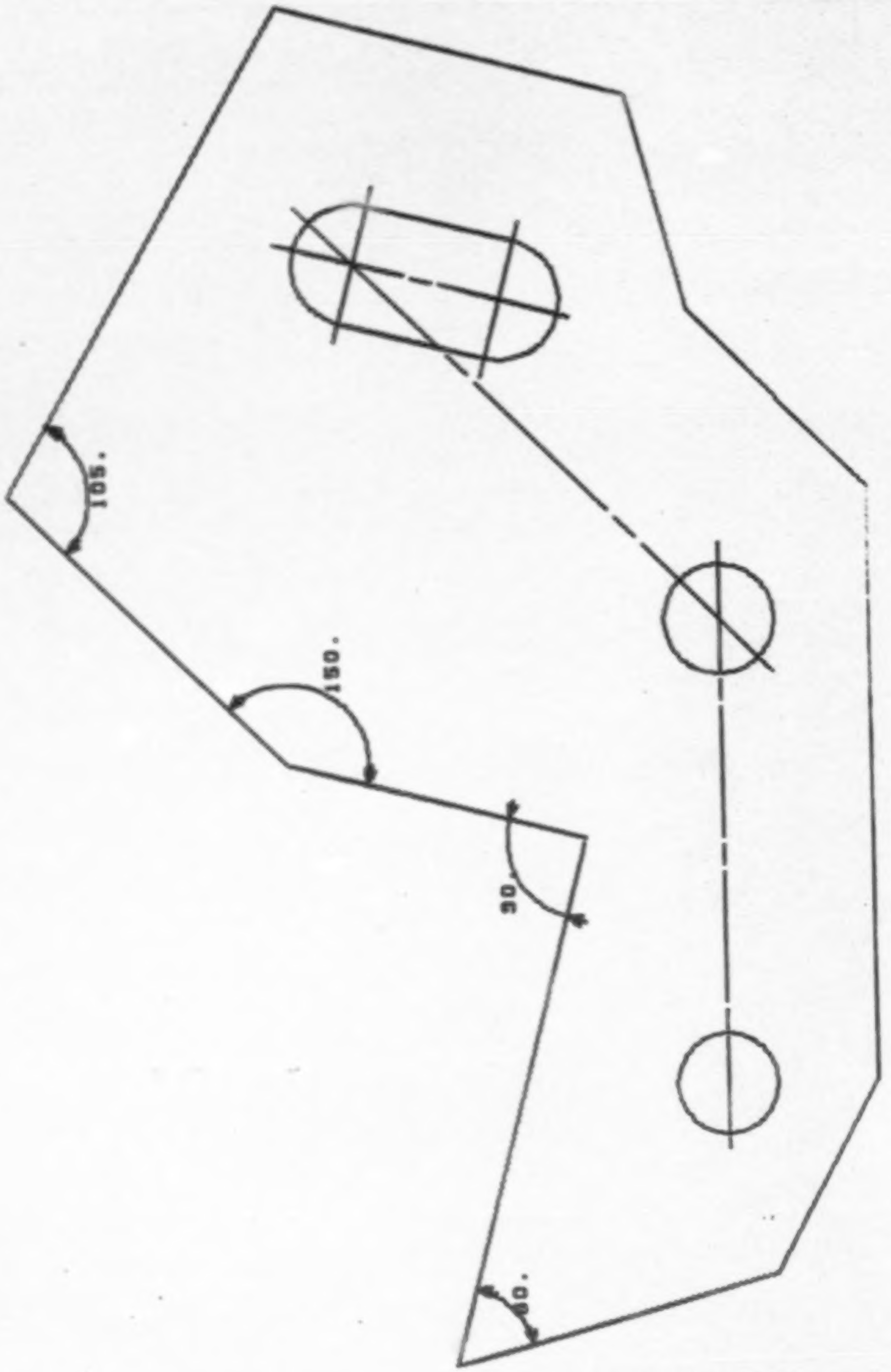
105.
150.
90.
60.

PLATE 9

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```
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$$  PLATE 9          SHEAR PLATE WITH DIMENSIONS   LONG X
  BOX       =       VIEW  /
                    CALL  /FRAME1,,X=10,,Y=6.5,,ORX=.5,,ORY=.5
                    END/BOX
                    DRAW/BOX
                    ALPHAP/(.2,.2,0,-.2),(0,0,0,270)
                    TITLE /1.5,2.5,@PLATE  9@
  PLATE     =       VIEW  /
                    ORIGIN/NOMORE
  A         =       POINT /3.45,1.08
                    LINE  /A,DX,3+11/16
                    LINE  /PPP,ATANGL,45,LENGTH,1+9/16
                    LINE  /PPP,ATANGL,15,LENGTH,1+3/8
  D         =       POINT /PPP
                    LINE  /PPP,ATANGL,75,LENGTH,2+7/32
  E         =       POINT /PPP
                    LINE  /PPP,ATANGL,150,LENGTH,3+7/16
  F         =       POINT /PPP
                    LINE  /PPP,ATANGL,225,LENGTH,2+25/64
  G         =       POINT /PPP
                    LINE  /PPP,ATANGL,255,LENGTH,1+29/32
  H         =       POINT /PPP
                    LINE  /PPP,ATANGL,165,LENGTH,3+3/8
  J         =       POINT /PPP
  P1        =       LINE  /PPP,ATANGL,285,LENGTH,2+3/32
                    LINE  /PPP,A
  P2        =       PT    /A,DY,15/16
                    CR    /P2,5/16
  P3        =       PT    /P2,DX,2+7/8
                    CR    /P3,11/32
                    PT    /DX,.125
               CTRLN,LN   /DX,-3.75
  P4        =       PT    /P3,ATANGL,225,LENGTH,15/32
  LCL       =CTRLN ,LN    /P4,ATANGL,45,LENGTH,3+20/32
              CTRLN ,LN   /(PT/LCL),ATANGL,45,LENGTH,1/2
  P5        =       PT    /(PT/LCL),ATANGL,75,LENGTH,1/2
  P6        =       PT    /(PT/LCL),ATANGL,255,LENGTH,15/16
  P7        =       PT    /P6,ATANGL,255,LENGTH,1/2
  P8        =       PT    /(PT/LCL),ATANGL,165,LENGTH,1/2
  LXL       =CTRLN ,LN    /P5,P7
  L12       =CTRLN ,LN    /P8,PERPTO,LXL
              CTRLN ,LN   /PPP,ATANGL,345,LENGTH,1/2
  P9        =       PT    /(PT/LCL),ATANGL,165,LENGTH,3/8
  P10       =       PT    /P6,ATANGL,165,LENGTH,3/8
                    LN    /P10,P9
                    ARC   /(PT/LCL),3/8,165,180,CLW
                    LN    /PPP,ATANGL,255,LENGTH,15/16
                    ARC   /P6,3/8,345,180 ,CLW
              CTRLN ,LN   /P6,ATANGL,165,LENGTH,1/2
              CTRLN ,LN   /P6,ATANGL,345,LENGTH,1/2
                    END   /PLATE
                    DRAW  /PLATE
```

```
DIMP  /.5,.1,1,1
DIM   /J,.5,285,60
DIM   /M,.5,165,-90
DIM   /G,.5,255,150
DIM   /F,.5,225,105
FINI/
```

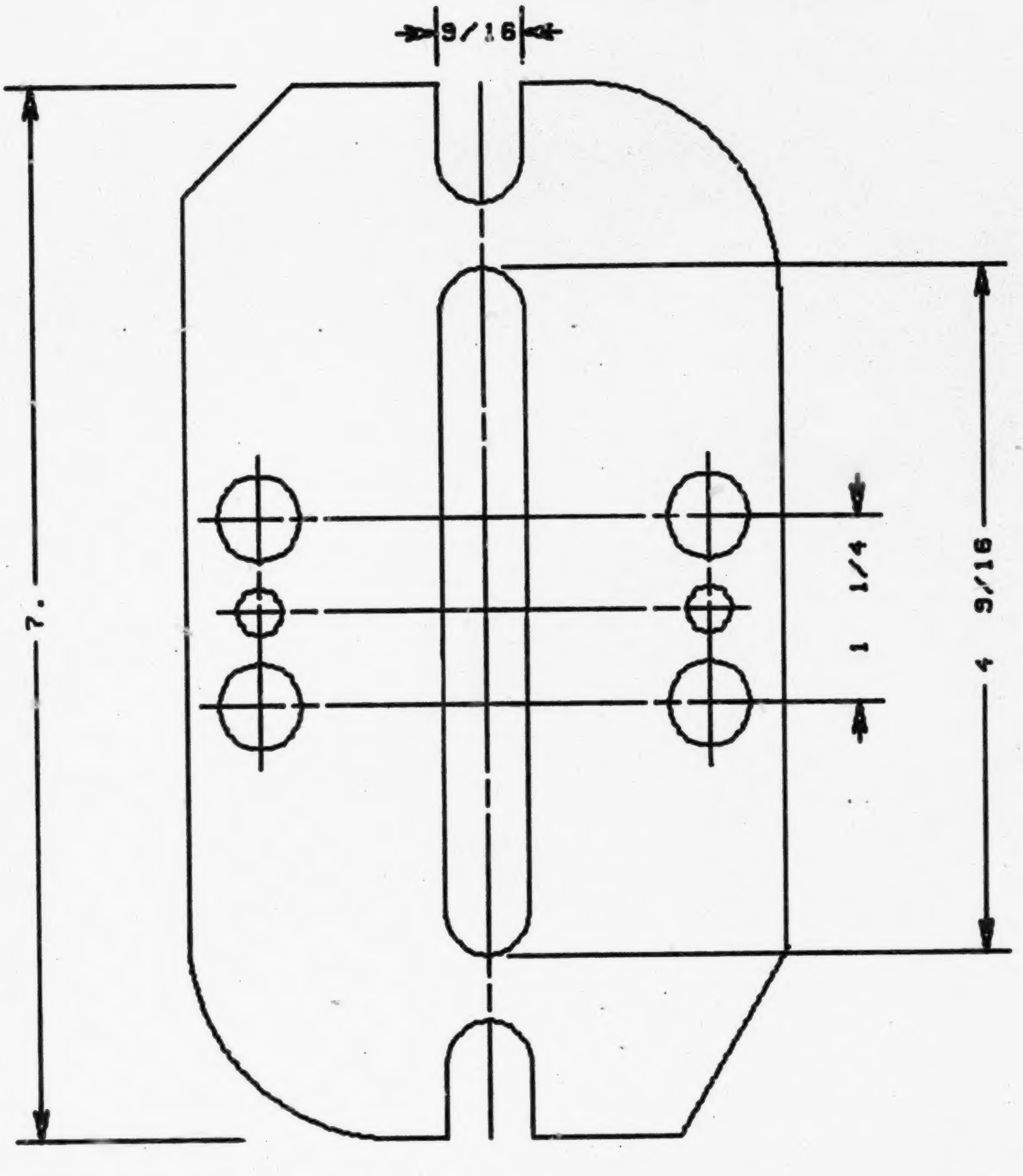
9/16
7.
1 1/4
4 9/16

PLATE 10

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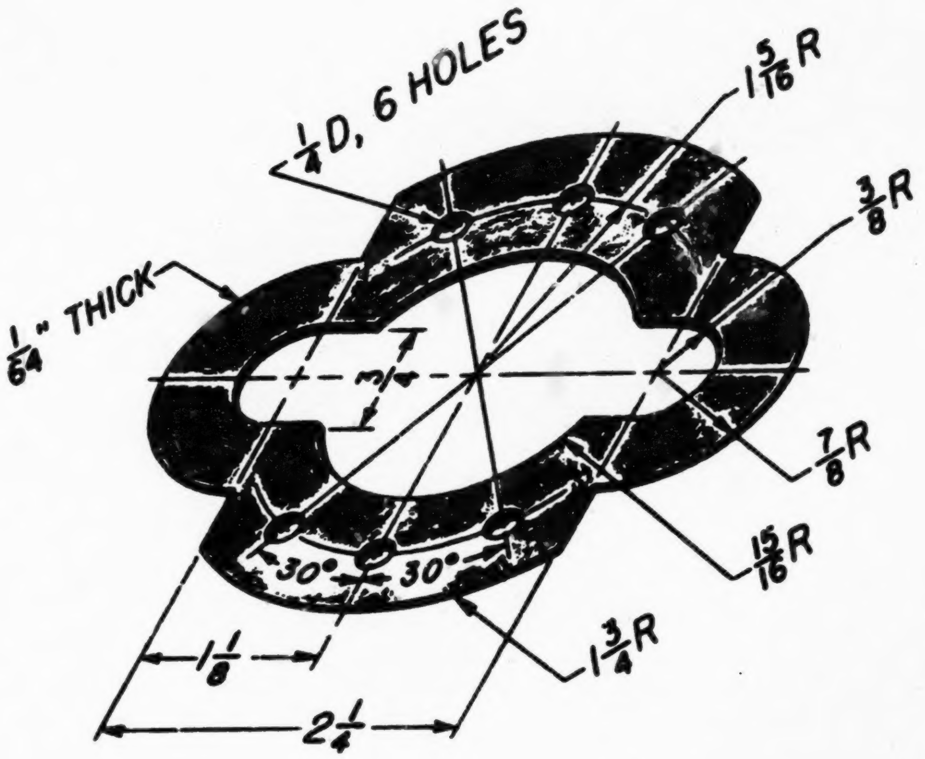
```
$$  PLATE 10         FIXTURE BASE WITH DIMENSIONS
  BOX      =         VIEW/
                     CALL   /FRAME1,,X=6.5,,Y=10,,ORX=1.5,,ORY=.5
                     END    /BOX
                     DRAW   /BOX
                     ALPHAP/(.2,.2,.2,0),(0,0,0,0)
                     TITLE/5.5,1.5,@PLATE 10@
  BASE     =         VIEW  /
                     SCALE /3/4
                     ORIGIN/4.75,6
                     LINE   /2,-2.25,ATANGL,240,TILLY,-3.5
                     LINE   /PPP,ATANGL,180,TILLX,9/32
                     LINE   /DY,.5
                     ARC    /0,-3,9/32,0,180
                     LINE   /PPP,DY,-.5
                     LINE   /DX,-(2-9/32)
                     ARC    /1.375
                     LINE   /DY,6.25
                     LINE   /DX,3/4,DY,3/4
                     LINE   /DX,2-(3/4+9/32)
  P1       =         PT     /PPP
                     LINE   /DY,-.5
                     ARC    /0,3,9/32,180,180
                     LINE   /DY,.5
  P2       =         PT     /PPP
                     LINE   /DX,2-9/32
                     ARC    /1.375
                     LINE   /DY,-5.75
  P3       =         PT     /-1.5,-3.5
  P4       =         PT     /-1.5,3.5
                     END    /BASE
                     DRAW   /BASE
                     MASK   /@P,F16@
                     DIMP   /.25,.1,2,2
                     DIMST  /YLARGE,XCOMP,P1,P2,.25
                     DIM    /P1,P2
                     DIMP   /.5,.1,1,1
                     DIMST  /XSMALL,YCOMP,-2,-1,-2,1,.75
                     DIM    /P3,P4
  SLOT     =         VIEW  /
  P5       =         PT     /0,-(2+9/32)
  P6       =         PT     /0,2+9/32
                     LN     /9/32,0,DY,2
                     ARC    /0,2,9/32,0,180
                     LN     /DY,-2
              CTRLN,LN      /0,0,DY,3.5
                     END    /SLOT
                     DRAW   /SLOT
                     DRAW   /MIRY(SLOT)
                     DIMST  /XLARGE,YCOMP,P5,P6,2.5
                     DIM    /P5,P6
  CIR      =         VIEW  /
```

```
P7        =         PT     /1.5,-5/8
P8        =         PT     /1.5,5/8
               CTRLN,LN     /0,-5/8,DX,1+29/32
               CTRLN,LN     /0,0,DX,1+25/32
               CTRLN,LN     /0,5/8,DX,1+29/32
               CTRLN,LN     /1.5,-(1+1/32),DY,2+1/16
                    CR     /1.5,-5/8,9/32
                    CR     /1.5,0,5/32
                    CR     /1.5,5/8,9/32
                    END    /CIR
                    DRAW   /CIR
                    DRAW   /MIRX(CIR)
                    DIMST  /XLARGE,YCOMP,P7,P8,.75
                    DIMP   /.6,.1,2,2
                    DIM    /P7,P8
 FINI /
```


$\frac{1}{4}$D, 6 HOLES
$1\frac{5}{16}$R
$\frac{3}{8}$R
$\frac{1}{64}$" THICK
$\frac{3}{8}$
$\frac{7}{8}$R
$\frac{15}{16}$R
30°
30°
$1\frac{3}{4}$R
$1\frac{1}{8}$
$2\frac{1}{4}$

SKETCH II

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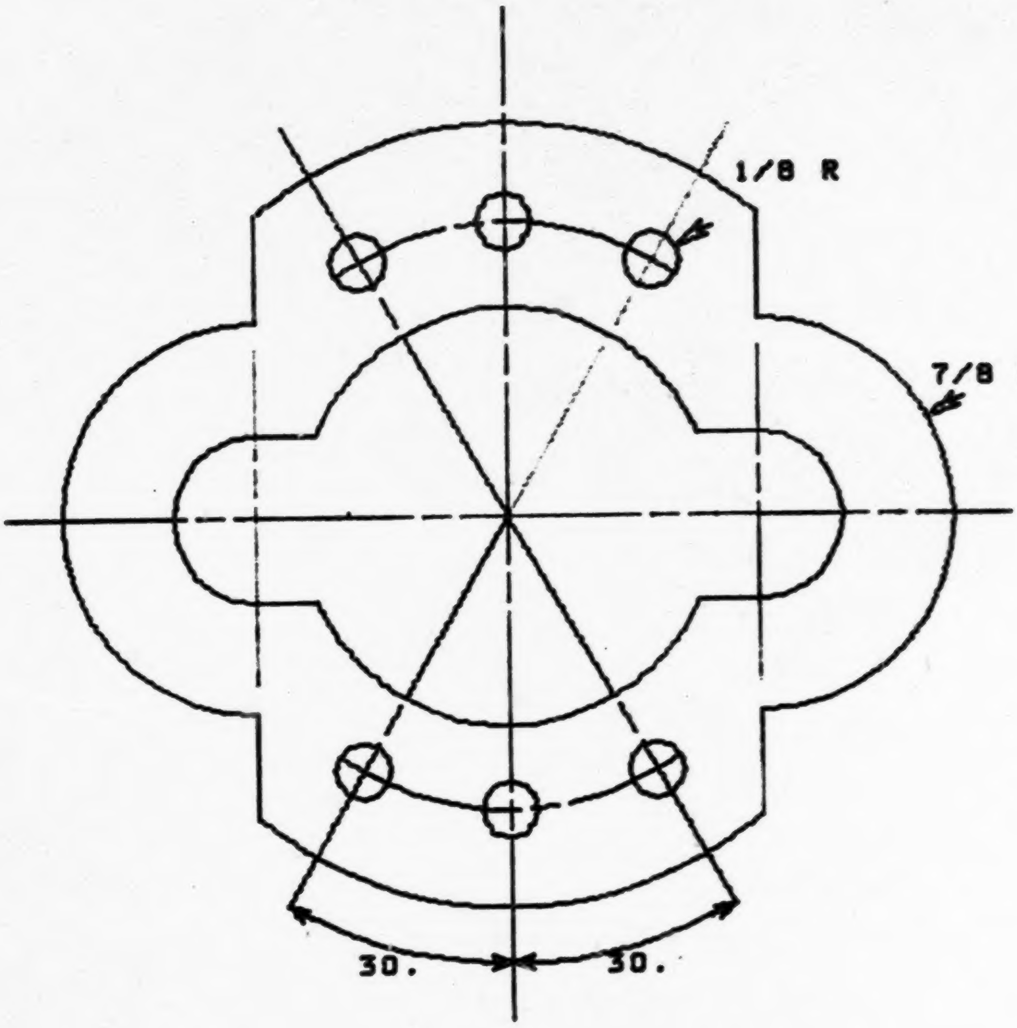
1/8 R
7/8 R
30.
30.

PLATE 11

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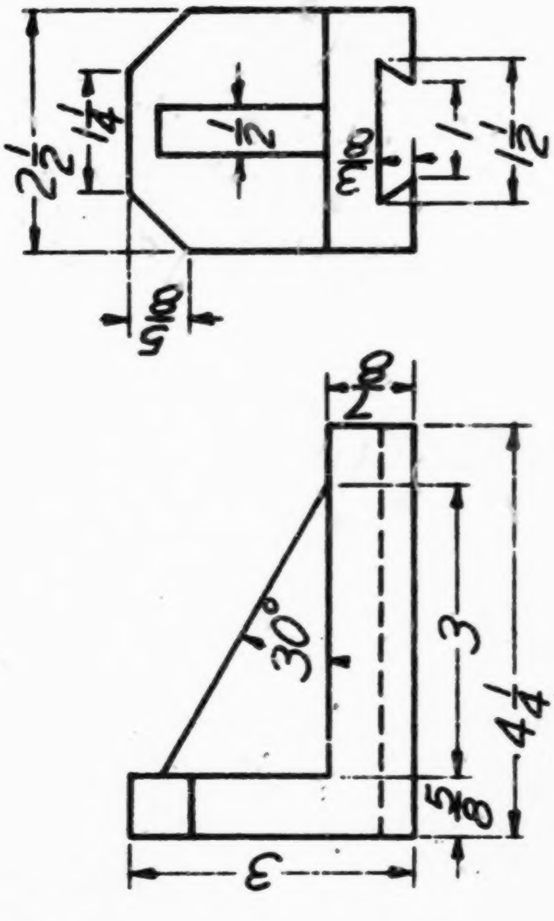
```
$$  PLATE 11        INTERSECTION OF ARCS-GASKET
                    ALPHAP/(.2,.2,.2,0),(0,0,0,0)
                    TITLE /6,1.5,@PLATE 11@
    GASKET=         VIEW/
    L1     =CONSTR,LINE  /1.125,-3,DY,.01
    L2     =CONSTR,LINE  /-1.125,-3,DY,.01
    L3     =CONSTR,LINE  /-2,-3/8,DX,.01
    L4     =CONSTR,LINE  /-2,3/8,DX,.01
    C1     =CONSTR,CIRCLE/0,0,1.75
    P1     =        POINT /YLARGE,INTOF,L2,C1
    P2     =        POINT /YLARGE,INTOF,L1,C1
    P3     =        POINT /YSMALL,INTOF,L1,C1
    P4     =        POINT /YSMALL,INTOF,L2,C1
    C2     =CONSTR,CIRCLE/1.125,0,7/8
    C3     =CONSTR,CIRCLE/-1.125,0,7/8
    P5     =        POINT /YLARGE,INTOF,L1,C2
    P6     =        POINT /YSMALL,INTOF,L1,C2
    P8     =        POINT /YLARGE,INTOF,L2,C3
    P7     =        POINT /YSMALL,INTOF,L2,C3
                    ARC   /P1,P2,YSMALL,RADIUS,1.75,CLW
                    LINE  /PPP,P5
                    ARC   /P5,P6,XSMALL,RADIUS,7/8,CLW
                    LINE  /PPP,P3
                    ARC   /P3,P4,YLARGE,RADIUS,1.75,CLW
                    LINE  /PPP,P7
                    ARC   /P7,P8,XLARGE,RADIUS,7/8,CLW
                    LINE  /PPP,P1
    C4     =CONSTR,CIRCLE/0,0,15/16
    C5     =CONSTR,CIRCLE/-1.125,0,3/8
    C6     =CONSTR,CIRCLE/1.125,0,3/8
    P20    =        POINT /YLARGE,INTOF,L1,C6
    P21    =        POINT /YSMALL,INTOF,L1,C6
    P22    =        POINT /YSMALL,INTOF,L2,C5
    P23    =        POINT /YLARGE,INTOF,L2,C5
    P24    =        POINT /XSMALL,INTOF,L4,C4
    P25    =        POINT /XLARGE,INTOF,L4,C4
    P26    =        POINT /XLARGE,INTOF,L3,C4
    P27    =        POINT /XSMALL,INTOF,L3,C4
                    ARC   /P24,P25,YSMALL,RADIUS,15/16,CLW
                    LINE  /PPP,P20
                    ARC   /P20,P21,XSMALL,RADIUS,3/8,CLW
                    LINE  /PPP,P26
                    ARC   /P26,P27,YLARGE,RADIUS,15/16,CLW
                    LINE  /P27,P22
                    ARC   /P22,P23,XLARGE,RADIUS,3/8,CLW
                    LINE  /P23,P24
    CLACIR=CTRLN  ,SHAPE /
                    LN    /-2.25,0,2.25,0
                    LN    /0,-2.25,0,2.25
                    LN    /-1.125,-.75,-1.125,.75
                    LN    /1.125,-.75,1.125,.75
                    LN    /0,0,ATANGL,60,LENGTH,2
```

```
                LN    /0,0,ATANGL,120,LENGTH,2
                LN    /0,0,ATANGL,240,LENGTH,2
                LN    /0,0,ATANGL,300,LENGTH,2
                ARC   /0,0,1+5/16,55,70
                ARC   /0,0,1+5/16,235,70
                END   /CLACIR
   L101 =CONSTR,LN    /0,0,ATANGL,60,LENGTH,1+5/16
C7      =       CIRCLE/(PT/L101),1/8
   L111 =CONSTR,LN    /0,0,ATANGL,120,LENGTH,1+5/16
                CIRCLE/(PT/L111),1/8
   L112 =CONSTR,LN    /0,0,ATANGL,240,LENGTH,1+5/16
                CIRCLE/(PT/L112),1/8
                CIRCLE/0,1+5/16,1/8
   L113 =CONSTR,LN    /0,0,ATANGL,300,LENGTH,1+5/16
                CIRCLE/(PT/L113),1/8
                CIRCLE/0,-1-5/16,1/8
                END   /GASKET
                ORIGIN/4.75,6
                DRAW  /GASKET
                MASK  /@H,F8@
                DIMP  /.5,.2,1,1
                DIM   /0,0,2,240,30
                DIM   /0,0,2,270,30
                DIMP  /1.2,.2,0,2
                DIMCR /C7,30,@1/8 R@
                DIMP  /3.5,.2,0,2
                DIMCR /C2,30,@7/8 R@
                FINI  /
```


2 1/2
1 1/4
1/2
3/8
1
1 1/2
5/8
7/8
30°
3
4 1/4
5/8
3

SKETCH 12

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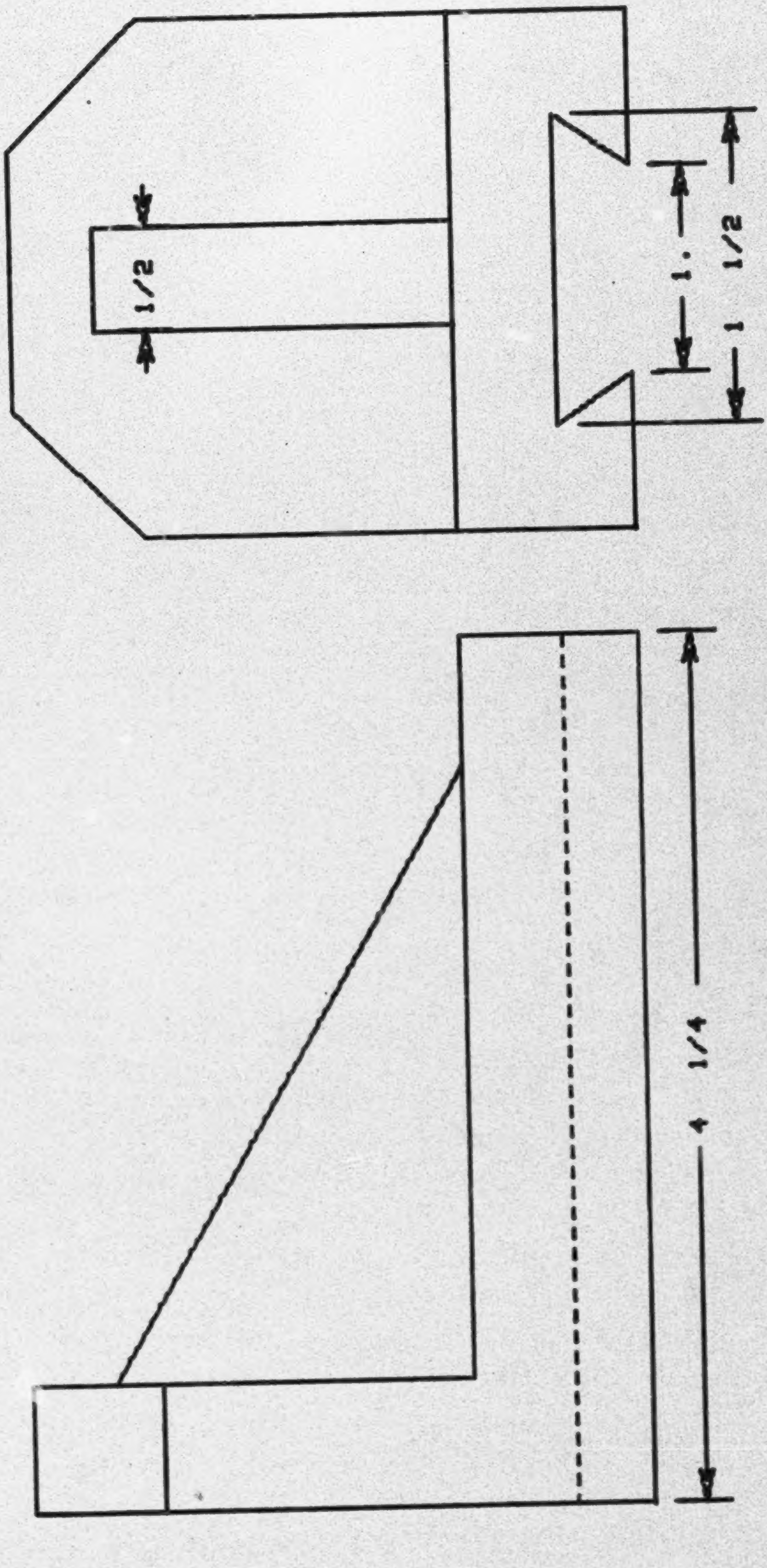

PLATE 12

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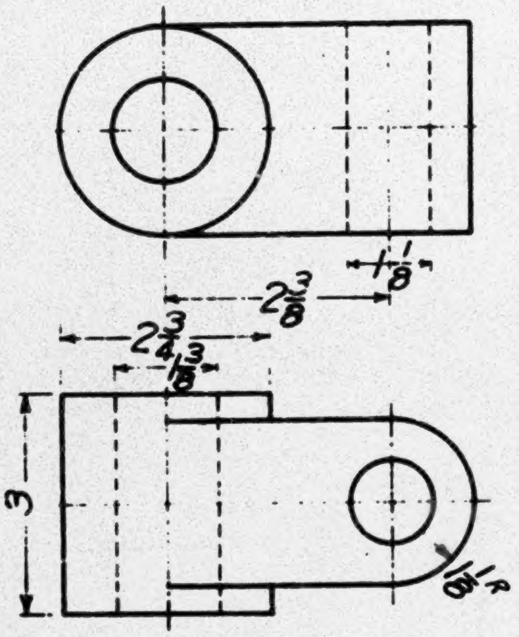
$$  PLATE 12         TWO VIEW DRAWING WITH UNKNOWN DISTANCE-DOVETAIL STOP
                     (LONG -X-)
                    ALPHAP/(.2,.2,0,-.2),(0,0,0,270)
                    TITLE /1.5,2.5,@PLATE 12@
  SIDE     =        VIEW  /
                    LN     /DX,4.25
  P2       =        PT     /PPP
                    LN     /DY,7/8
                    LN     /DX,-(4.25-5/8)
                    LN     /DY,2.125
                    LN     /DX,-5/8
                    LN     /DY,-3
  P1       =        PT     /PPP
                    LN     /0,2.375,DX,5/8
                    LN     /3.625,7/8,ATANGL,150,TILLX,5/8
             DOTTED,LN     /0,3/8,DX,4.25
                    END    /SIDE
                    ORIGIN/2.25,2.25
                    DRAW   /SIDE
                    MASK   /@P,F16@
                    DIMP   /.5,.1,1,1
                    DIMST  /YSMALL,XCOMP,P1,P2,.25
                    DIM    /P1,P2
  FRONT    =        VIEW   /
                    LN     /DX,3/4
  P3       =        PT     /PPP
                    LN     /DX,-.25,DY,3/8
  P4       =        PT     /PPP
                    LN     /DX,1.5
  P5       =        PT     /PPP
                    LN     /DX,-.25,DY,-3/8
  P6       =        PT     /PPP
                    LN     /DX,3/4
                    LN     /DY,2.375
                    LN     /DX,-5/8,DY,5/8
                    LN     /DX,-1.25
                    LN     /DX,-5/8,DY,-5/8
                    LN     /DY,-2.375
                    LN     /1,.875,DY,3/COSD(30)*SIND(30)
  P7       =        PT     /PPP
                    LN     /DX,.5
  P8       =        PT     /PPP
                    LN     /PPP,ATANGL,270,TILLY,7/8
             CONSTR,LN      /DX,1
                    LN     /DX,-2.5
                    END    /FRONT
                    ORIGIN/7,2.25
                    DRAW   /FRONT
                    DIMST  /YSMALL,XCOMP,P3,P6,.25
                    DIM    /P3,P6
                    DIM    /P4,P5
                    DIMP   /.3,.1,2,2
```

```
DIMST /YSMALL,XCOMP,P7,P8,.25
DIMNN /P7,P8
FINI  /
```


$1\frac{1}{8}$
$2\frac{3}{8}$
$2\frac{3}{4}$
$1\frac{3}{8}$
3
$1\frac{1}{8}$ R

SKETCH 13

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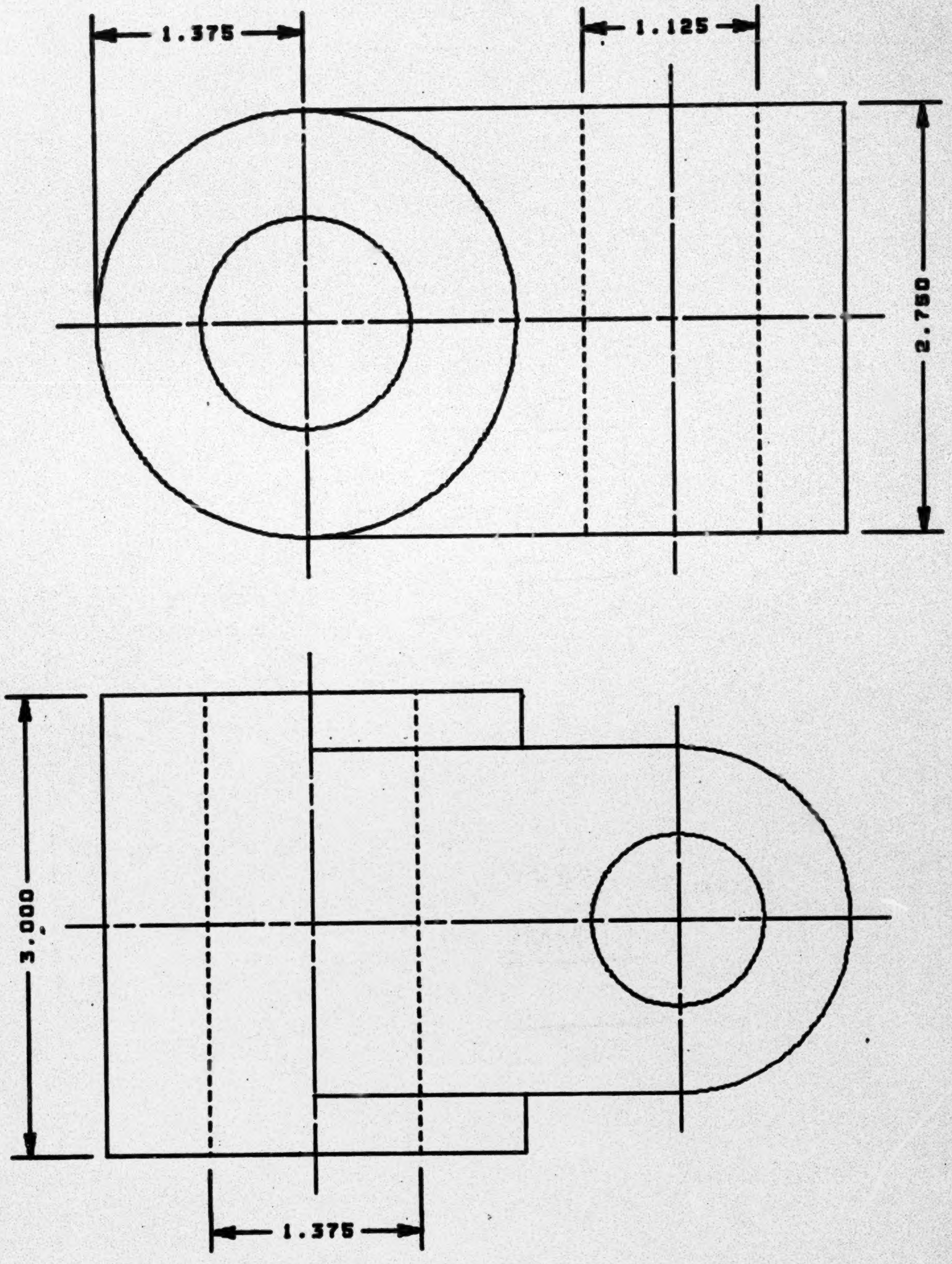
1.375
1.125
2.750
3.000
1.375

PLATE 13

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```
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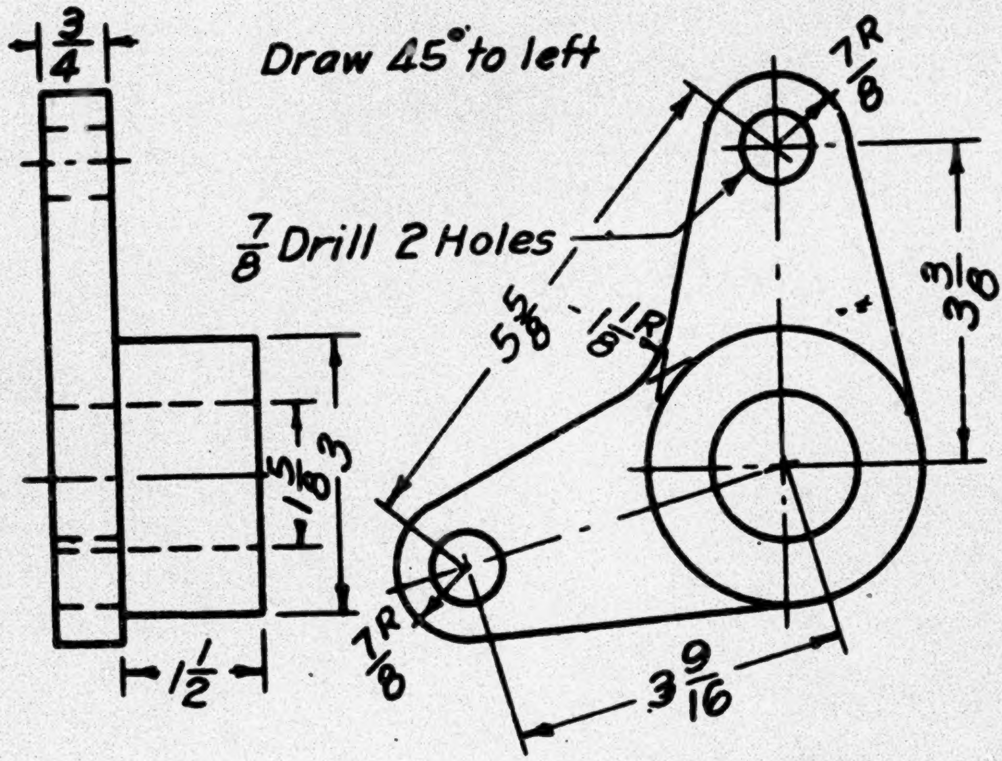
$$  PLATE 13       TWO VIEW DRAWING-CROSS LINK
                  ALPHAP/(.2,.2,.2,0),(0,0,0,0)
                  TITLE /6,1.5,@PLATE 13@
  TOP     =       VIEW  /
  L1      =CTRLN ,LN    /-1.625,0,DX,1.625+2.375+1.125+.25
           CTRLN ,LN    /2.375,1.625,DY,-1.625*2
           CTRLN ,LN    /0,-1.625,DY,1.625*2
                  CR    /0,0,1.375/2
  C1      =       CR    /0,0,2.75/2
                  LN    /0,1.375,DX,3.5
  P1      =       PT    /PPP
                  LN    /DY,-2.75
  P2      =       PT    /PPP
                  LN    /PPP,LEFT,TANTO,C1
           DOTTED,LN    /2.375-1.125/2,1.375,DY,-2.75
           CONSTR,LN    /DX,1.125
           DOTTED,LN    /DY,2.75
  P4      =       PT    /PPP
  P3      =       PT    /2.375-1.125/2,1.375
  P5      =       PT    /0,1.375
  P6      =       PT    /XSMALL,INTOF,L1,C1
                  END   /TOP
                  ORIGIN/2.312+11/8,8.0
                  DRAW  /TOP
                  MASK  /@P,D3@
                  DIMP  /.5,.1,1,1
                  DIMST /YLARGE,XCOMP,P3,P4
                  DIM   /P3,P4
                  INDEX /-1
                  DIM   /P6,P5
                  DIMP  /.5,.1,1,1
                  DIMST /XLARGE,YCOMP,P1,P2
                  DIM   /P1,P2
  BOTTOM  =       VIEW  /
           CTRLN ,LN    /0,1.375,DY,-(1.125*2+.5)
           CTRLN ,LN    /1.375,0,DX,-(1.125+2.375+2.75/2+.5)
           CTRLN ,LN    /-2.375,1.75,DY,-3.5
                  LN    /-(2.375-2.75/2),1.125,DY,1.5-1.125
                  LN    /DX,-2.75
  P7      =       PT    /PPP
                  LN    /DY,-3
  P8      =       PT    /PPP
                  LN    /DX,2.75
                  LN    /DY,1.5-1.125
           CONSTR,LN    /DX,-(2.75/2)
                  LN    /DX,2.375
                  ARC   /0,0,1.125,270,180
                  LN    /DX,-2.375
                  CR    /0,0,1.125/2
           DOTTED,LN    /-(2.375+1.375/2),1.5,DY,-3
  P9      =       PT    /PPP
           CONSTR,LN    /DX,1.375
```

```
P10      =      PT     /PPP
         DOTTED,LN     /DY,3
                END    /BOTTOM
                ORIGIN/4.687+11/8,4.125
                DRAW   /BOTTOM
                MASK   /@P,D3@
                DIMP   /.5,.1,1,1
                DIMST  /XSMALL,YCOMP,P8,P7
                DIM    /P8,P7
                DIMST  /YSMALL,XCOMP,P9,P10
                DIM    /P9,P10
                FINI   /
```


3/4
7/8 R
7/8 Drill 2 Holes
5 5/8
1/8 R
3 3/8
3
1 5/8
1 1/2
7/8 R
3 9/16

Draw 45° to left

SKETCH 14

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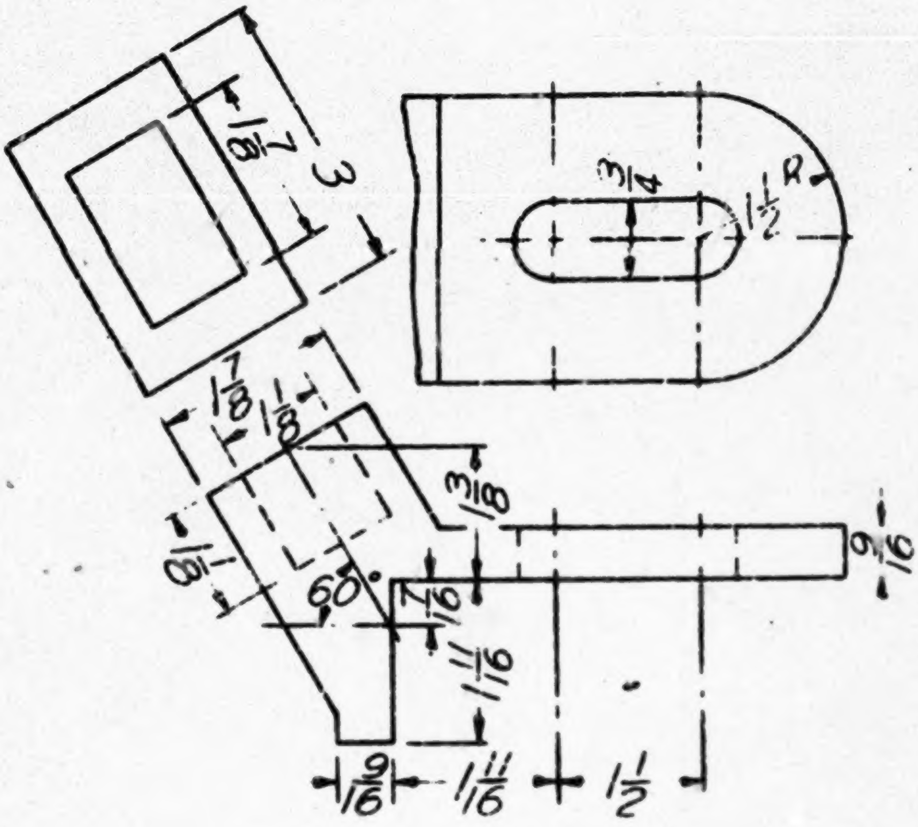
```
$$  PLATE 14       TWO VIEW DRAWING-BELL CRANK
                  ALPHAP/(.2,.2,.2,0),(0,0,0,0)
                  TITLE /6,1.5,@PLATE 14@
                  SCALE /.5
  CRANK    =      VIEW  /
                  CIRCLE/0,0,1.625/2
  C1       =      CIRCLE/0,0,1.5
  C2      =CONSTR,CR     /0,0,3.562
  C3      =CONSTR,CR     /0,3.375,5.625
           CONSTR,LN     /0,0,DY,4.25
  L7      =CONSTR,LN     /PPP,DX,-.1
           CONSTR,LN     /PPP,DY,-(.875-.875/2)
  L6      =CONSTR,LN     /PPP,DX,-.1
  P1       =      PT     /XSMALL,INTOF,C2,C3
  C4      =CONSTR,CR     /P1,.875
  C5      =CONSTR,CR     /0,3.375,.875
  L1      =CONSTR,LN     /LEFT,TANTO,C1,LEFT,TANTO,C5
  L2      =CONSTR,LN     /RIGHT,TANTO,C1,RIGHT,TANTO,C4
  P2       =      PT     /INTOF,L1,L2
  P3       =      LN     /RIGHT,TANTO,C1,RIGHT,TANTO,C5
  P4      =CONSTR,LN     /P2,LEFT,TANTO,C5
                  ARC    /(PT/P3),(PT/P4),YSMALL,RADIUS,.875
                  LN     /PPP,P2
                  ARC    /1.125
  P5       =      LN     /P2,RIGHT,TANTO,C4
  P6      =CONSTR,LN     /LEFT,TANTO,C1,LEFT,TANTO,C4
                  ARC    /(PT/P5),(PT/P6),XLARGE,RADIUS,.875
                  LN     /(PT/P6),RIGHT,TANTO,C1
  L3      =CONSTR,LN     /0,0,P1
           CTRLN ,LN     /ANGOF(L3),LENGTH,4.687
           CTRLN ,LN     /-1.75,0,DX,3.5
           CTRLN ,LN     /0,-1.75,DY,6.25
           CTRLN ,LN     /-1.125,3.375,DX,2.25
                  CR     /0,3.375,.875/2
  P7      =CONSTR,LN     /ANGOF(L3),LENGTH,3.562
  A1      =               ATAND(L3)
           CONSTR,LN     /PPP,ATANGL,A1-90,LENGTH,1.125
           CTRLN ,LN     /PPP,ATANGL,A1+90,LENGTH,2.25
                  CR     /(PT/P7),.875/2
  L4      =CONSTR,LN     /0,0,0,3.375
  L5      =CONSTR,LN     /P1,(PT/L4)
  P8       =      PT     /INTOF,P6,C4
  L8      =CONSTR,LN     /P8,DX,-4.25
                  LN     /PPP,DX,.75
  P99      =      PT     /PPP
  L10     =CONSTR,LN     /PPP,DY,.1
  P9       =      PT     /INTOF,L7,L10
  L9       =      LN     /P99,P9
                  LN     /PPP,DX,-.75
  P1212    =      PT     /PPP
  L12     =CONSTR,LN     /PPP,DY,-.1
  P12      =      PT     /INTOF,L12,L8
```

```
              LN    /P1212,P12
P10    =      PT    /INTOF,P6,C1
L11    =CONSTR,LN   /PPP,DX,-.1
P11    =      PT    /INTOF,L9,L11
              LN    /P11,DX,1.5
P15    =      PT    /PPP
              LN    /PPP,DY,3
P16    =      PT    /PPP
              LN    /PPP,DX,-1.5
        CONSTR,LN   /PPP,DX,-.75
        CONSTR,LN   /PPP,DY,-.6875
        DOTTED,LN   /PPP,DX,2.25
        CONSTR,LN   /PPP,DY,-1.625
        DOTTED,LN   /PPP,DX,-2.25
        CONSTR,LN   /PPP,DY,1.625/2
        CONSTR,LN   /PPP,DX,-.125
        CTRLN ,LN   /PPP,DX,2.5
        CONSTR,LN   /P1,DY,.875/2
L13    =CONSTR,LN   /PPP,DX,-.1
P13    =      PT    /INTOF,L13,L10
        DOTTED,LN   /P13,DX,-.75
        CONSTR,LN   /PPP,DY,-.875
        DOTTED,LN   /PPP,DX,.75
P14    =      PT    /INTOF,L6,L10
        DOTTED,LN   /P14,DX,-.75
        CONSTR,LN   /PPP,DY,-.875
        DOTTED,LN   /PPP,DX,.75
        CONSTR,LN   /PPP,DY,.875/2
        CONSTR,LN   /PPP,DX,.125
        CTRLN ,LN   /PPP,DX,-1
              END   /CRANK
              ORIGIN/6.25,5.5
              DRAW  /CRANK
              MASK  /@P F32 TN@
              DIMP  /.5,.1,1,1
              DIMST /XSMALL,YCOMP,P12,P1212,.25
              DIM   /P12,P1212
              DIMST /XLARGE,YCOMP,P15,P16,.25
              DIM   /P15,P16
              DIMST /YLARGE,TRUE,L5,.75/2
              DIM   /L5
              DIMST /YSMALL,TRUE,L3,.75
              DIM   /L3
              DIMP  /2.2,.1,2,2
              DIMST /YSMALL,XCOMP,P12,P99,.25
              DIM   /P12,P99
              FINI  /
```



1 7/8
3
3/4
1 1/2 R
1 7/8
1 1/8
3/8
1 1/8
60°
7/16
9/16
1 11/16
9/16
1 11/16
1 1/2

SKETCH 15

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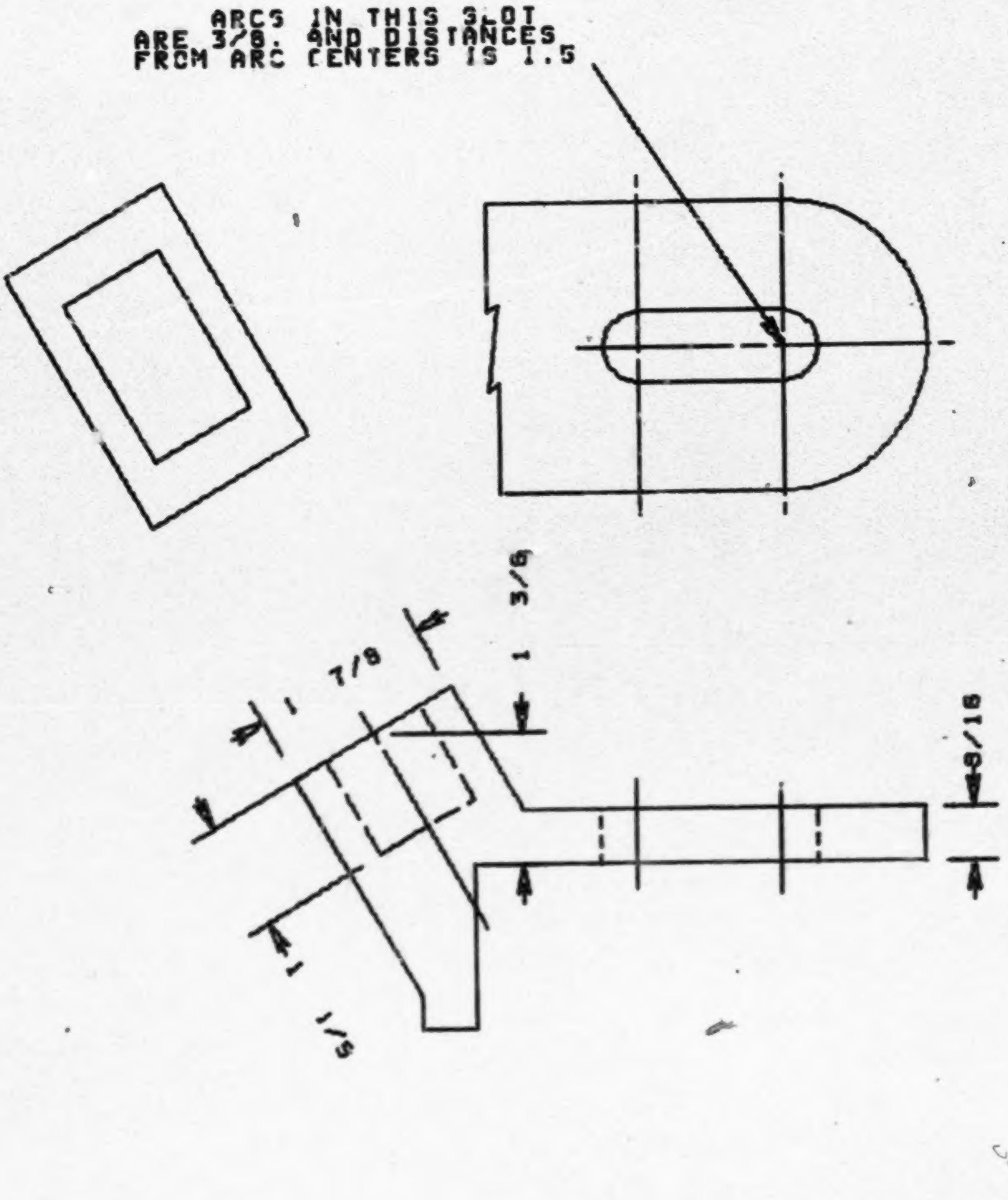

ARCS IN THIS SLOT
ARE 3/8. AND DISTANCES
FROM ARC CENTERS IS 1.5

1 3/8
1 7/8
9/16
1 1/5

PLATE 15

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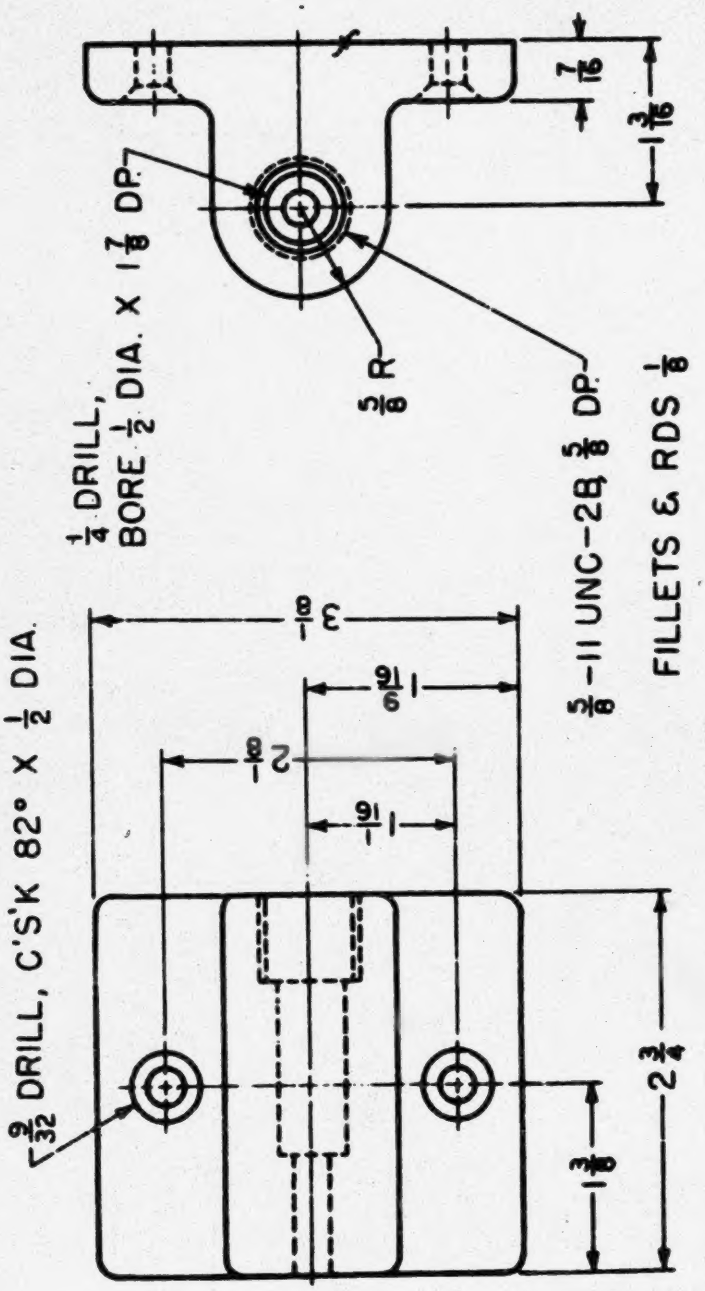
```
$$  PLATE 15          DRAWING AN AUXILIARY VIEW-STRUT ANCHOR
                     ALPHAP/(.2,.2,.2,0),(0,0,0,0)
                     TITLE /6,1.5,@PLATE 15@
                     SCALE /1/2
   FRONT     =       VIEW  /
                     ORIGIN/4.5,2+1+11/16
                     LN     /DX,9/16
   LXX       =       LN     /DY,1+11/16
   PX5       =       PT     /PPP
   P1        =       POINT /9/16,1+11/16-7/16
              CONSTR,LN     /P1,ATANGL,120,TILLY,1+11/16+1+3/8
   P2        =       PT     /PPP
              CONSTR,LN     /(POINT/P2),ATANGL,30,LENGTH,1.875/2
   P3        =       PT     /PPP
                     LN     /.562,1.687,DX,1.687+1.5+1.5
   PX1       =       PT     /PPP
   P4        =       LN     /DY,.562
   P5        =CONSTR,LN     /(POINT/P3),ATANGL,300,TILLY,2.25
                     LN     /(POINT/P4),(POINT/P5)
                     LN     /(POINT/P5),(POINT/P3)
                     LN     /(POINT/P3),ATANGL,210,LENGTH,1.875
   PX        =       PT     /PPP
              CONSTR,LN     /PX,ATANGL,120,LENGTH,3
   P11       =       PT     /PPP
              CONSTR,LN     /P11,ATANGL,300,LENGTH,3
                     LN     /PPP,ATANGL,300,TILLX,0
                     LN     /PPP,ATANGL,270,TILLY,0
              CONSTR,LN        /(PT/P2),ATANGL,210,LENGTH,.562
   PY        =       PT     /PPP
              DASHED,LN     /PPP,ATANGL,300,LENGTH,1.125
   PX2       =       PT     /PPP
              DASHED,LN     /PPP,ATANGL,30,LENGTH,1.125
              DASHED,LN     /PPP,ATANGL,120,LENGTH,1.125
   P6        =CONSTR,LN     /(PT/P2),ATANGL,120,LENGTH,.25
   P7        =CONSTR,LN     /(PT/P1),ATANGL,300,LENGTH,.25
              CTRLN ,LN     /(PT/P7),(PT/P6)
              CTRLN ,LN     /2.25,1.687-.25,DY,1.125
              CTRLN ,LN     /3.75,2.5,DY,-1.125
   PX3       =       PT     /1.875,1.687
              DOTTED,LN     /1.875,1.687,DY,.562
              CONSTR,LN     /DX,2.25
              DOTTED,LN     /DY,-.562
   PX4       =       PT     /PPP
                     END    /FRONT
                     DRAW   /FRONT
                     MASK   /@P,F16@
                     DIMP   /2,.1,2,2
                     DIMST  /XLARGE,YCOMP,PX1,(PT/P4),.25
                     DIM    /PX1,(PT/P4)
                     DIMST  /XLARGE,YCOMP,LXX
                     DIMNE  ,PX5,P2
                     DIMP   /.5,.1,2,2
```

```
                DIMST /YLARGE,TRUE,PX,P3,.25
                DIM   /PX,P3
                DIMP  /2,.1,2,2
                DIMST /YSMALL,TRUE,PY,PX2,.50
                DIM   /PY,PX2
TOP     =       VIEW  /
DIST1   =              DIST((PT/P4),(PT/P5))
P8      =       PT    /-(DIST1+.25),-1.5
                LN    /P8,DX,DIST1+.25-1.5
                ARC   /-1.5,0,1.5,270,180
P9      =       LN    /PPP,DX,-(DIST1+.375-1.5)
                LN    /(PT/P9),DY,-1.125
P10     =       LN    /PPP,ATANGL,30,LENGTH,.125
                LN    /P8,DY,1.125
                LN    /PPP,ATANGL,210,LENGTH,.125
                LN    /PPP,(PT/P10)
L1      =CTRLN ,LN    /-3.625,0,DX,3.875
         CTRLN ,LN    /-3,-1.75,DY,3.5
L2      =CTRLN ,LN    /-1.5,1.75,DY,-3.5
                LN    /-1.5,-.375,DX,-1.5
                ARC   /-3,0,.375,270,-180
                LN    /DX,1.5
                ARC   /-1.5,0,.375,90,-180
PX6     =       PT    /XLARGE,INTOF,L1,L2
                END   /TOP
                ORIGIN/7.125,5.5+1+11/16
                DRAW  /TOP
                ALPHAP/(.1,.1,.1,0),(0,.1,0,-5)
                NOTER /PX6,-1,1.5,@FROM ARC CENTERS IS 1.5@,$
@ARE 3/8, AND DISTANCES@,@    ARCS IN THIS SLOT@
SIDE    =       VIEW  /
                REFSYS/P11,ATANGL,30
                LN    /0,0,DX,1+7/8
                LN    /PPP,DY,3
                LN    /PPP,DX,-1-7/8
                LN    /PPP,DY,-3
                LN    /6/16,9/16,DX,1+1/8
                LN    /PPP,DY,1+7/8
                LN    /PPP,DX,-1-1/8
                LN    /PPP,DY,-1-7/8
                END   /SIDE
                ORIGIN/4.5,2+1+11/16
                DRAW  /SIDE
```



$\frac{9}{32}$ DRILL, C'S'K 82° X $\frac{1}{2}$ DIA.
$\frac{1}{4}$ DRILL,
BORE $\frac{1}{2}$ DIA. X $1\frac{7}{8}$ DP.
$\frac{5}{8}$ R
$\frac{5}{8}$-11 UNC-2B, $\frac{5}{8}$ DP.
FILLETS & RDS $\frac{1}{8}$
$3\frac{1}{8}$
$1\frac{9}{16}$
$2\frac{1}{8}$
$1\frac{1}{16}$
$2\frac{3}{4}$
$1\frac{3}{8}$
$\frac{7}{16}$
$1\frac{3}{16}$

SKETCH 16

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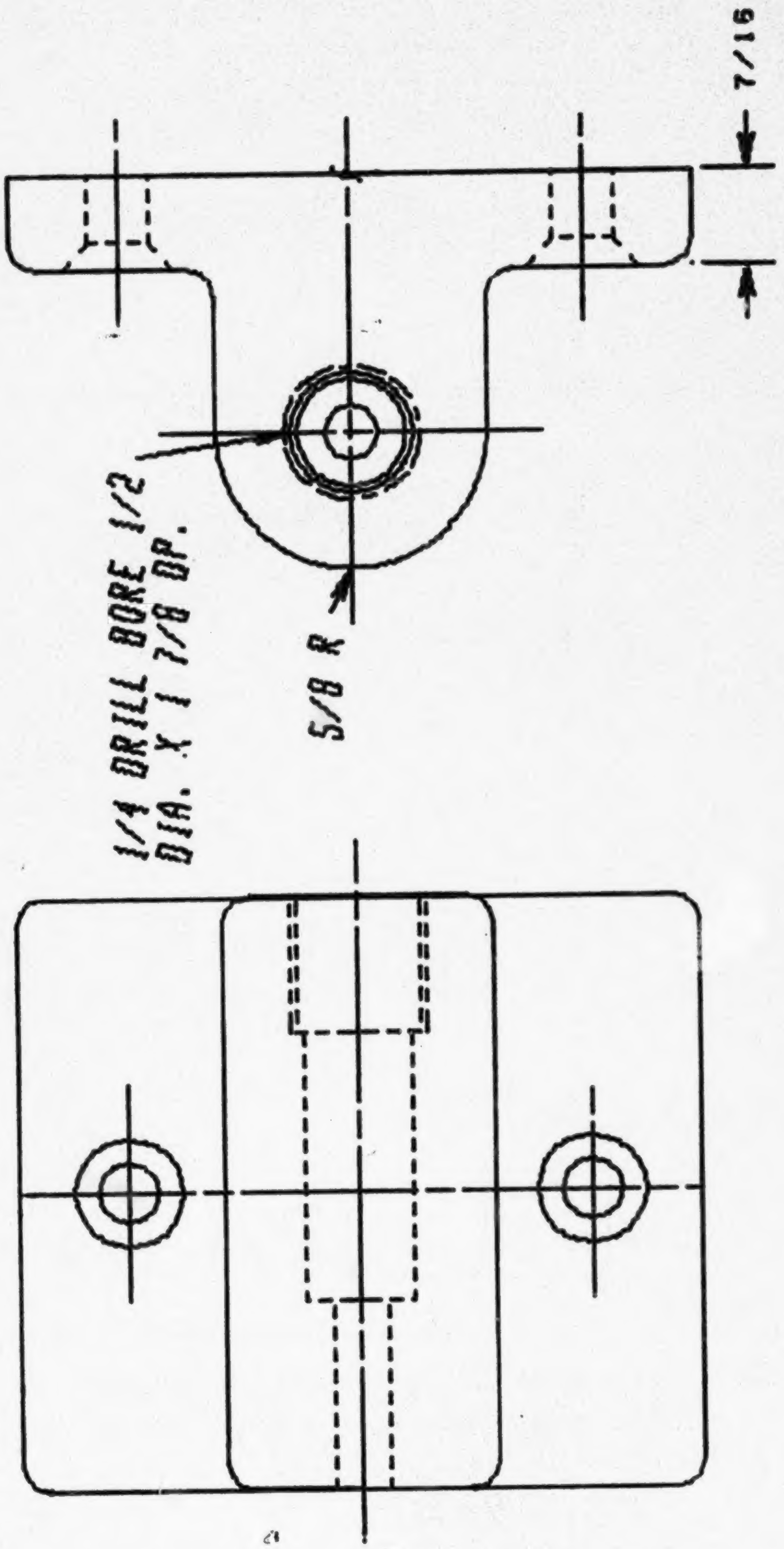
1/4 DRILL BORE 1/2
DIA. X 1 7/8 DP.
5/8 R
7/16

PLATE 16

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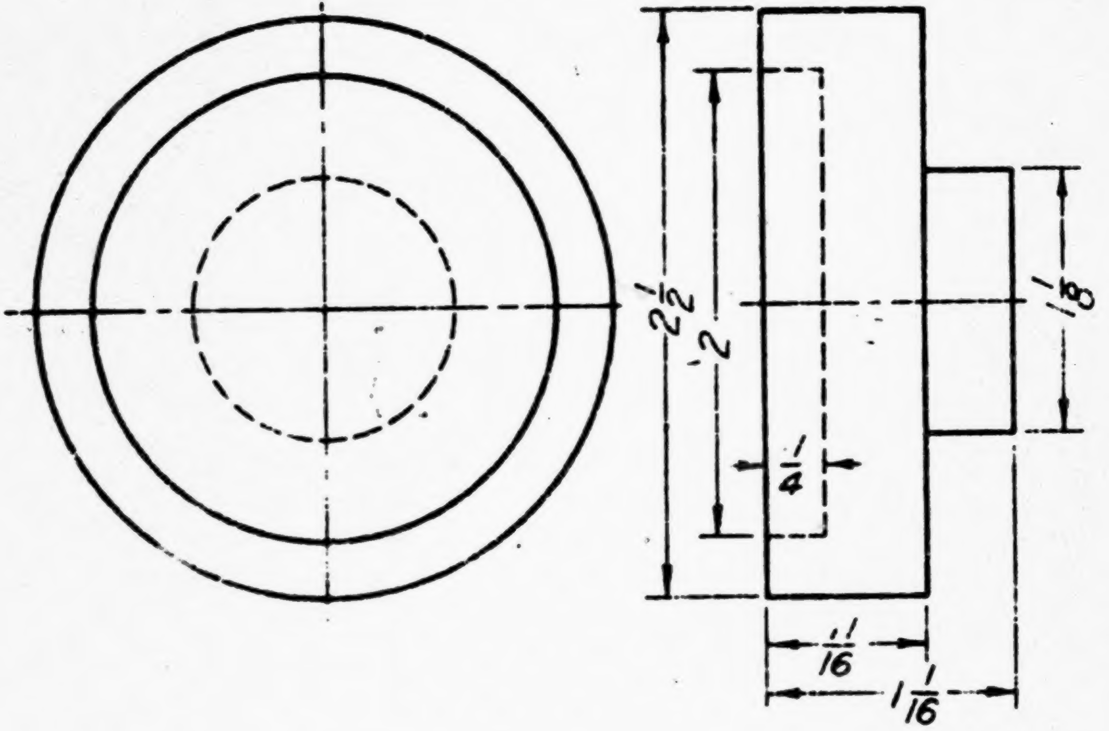
MIAMI-DADE JUNIOR COLLEGE

```
$$  PLATE 16       TWO VIEW DRAWING USING FILLETS  (LONG -X-)
  TOP     =       VIEW  /
                  LN    /0,3,DY,-3
                  ARC   /.125
                  LN    /DX,2.75
                  ARC   /.125
                  LN    /DY,3.125
                  ARC   /.125
                  LN    /DX,-2.75
                  ARC   /.125
                  LN    /DY,-.125
                  LN    /0,1.562,DY,.625
                  ARC   /.125
                  LN    /DX,2.75
                  ARC   /.125
                  LN    /DY,-1.25
                  ARC   /.125
                  LN    /DX,-2.75
                  ARC   /.125
                  LN    /DY,.125
           CTRLN ,LN    /-.25,1.562,DX,2.75+.5
  L1      =CTRLN ,LN    /1.375,2.625+.5,DY,-3.125
  L2      =CTRLN ,LN    /1.375-.5,.5,DX,1
  L3      =CTRLN ,LN    /1.375-.5,2.625,DX,1
  P1      =        PT   /INTOF,L1,L2,,P2=PT/INTOF,L1,L3
                   CR   /P1,9/64
                   CR   /P1,.25
                   CR   /P2,9/64
  CO      =        CR   /P2,.25
  PW      =        PT   /YLARGE,INTOF,L1,CO
                   END  /TOP
                   ORIGIN/3,2.188
                   DRAW /TOP
                   ALPHAP/(.1,.2,.1,0),(0,-.2,0,-15)
                         @ 82$DG$ X 1/2 DIA.@
  HOLE    =DOTTED,VIEW  /
                   LN   /0,.125,DX,2.75-1.875
                   LN   /2.75-1.875,0,DY,.25
                   LN   /DX,1.875-.625
                   LN   /2.75-.625,0,DY,5/16
                   LN   /DX,.625
            CONSTR,LN   /DY,-1/32
                   LN   /DX,-.625
                   END  /HOLE
                   ORIGIN/3,3.75
                   DRAW /HOLE
                   DRAW /MIRY(HOLE)
  SIDE    =        VIEW /
  L4      =CTRLN  ,LN   /-(.625+.25),0,DX,.625+1.187+.5
  L5      =CTRLN  ,LN   /0,.625+.25,DY,-(.625*2+.5)
  P3      =         PT  /INTOF,L4,L5
                    CR  /P3,.125
```

```
                CR    /P3,.25
C1       =      CR    /P3,.312-1/32
         DOTTED,CR    /P3,.312
                ARC   /P3,.625,90,180
                LN    /DX,1.187-.437
                ARC   /.125
                LN    /DY,-(1.562-.625)
P6       =      PT    /PPP
                ARC   /.125
                LN    /DX,.437
P7       =      PT    /PPP
                LN    /DY,3.125/2
PFN      =      PT    /PPP,,PX=PT/YLARGE,INTOF,L5,C1
                LN    /PFN,DY,3.125/2
                LN    /DX,-.437
                ARC   /.125
                LN    /DY,-(1.562-.625)
                ARC   /.125
                LN    /DX,-(1.187-.437)
                END   /SIDE
                ORIGIN/7.875,3.75
                DRAW  /SIDE
                NOTER /PX,-.125,.75,@1/4 DRILL BORE 1/2@,$
                       @DIA. X 1 7/8 DP.@
                NOTER /-5/8,0,-.25,.125,@5/8 R@
                NOTE  /PFN,@$FN$@
                MASK  /@P,F16@
                DIMP  /2,.1,2,2
                DIMST /YSMALL,XCOMP,P6,P7,.25
                DIM   /P6,P7
CSINK   =DOTTED,VIEW  /
         CTRLN ,LN    /1.187-(.437+.25),1.062,DX,.437+.5
P5       =      LN    /1.187-.437,1.062+.25,ATANGL,139,$
                       TILLY,1.062+9/64
                LN    /PPP,ATANGL,0,TILLX,1.187
                LN    /1.187-.437,1.062-.25,ATANGL,221,$
                       TILLY,1.062-9/64
                LN    /PPP,ATANGL,0,TILLX,1.187
                LN    /(POINT/P5),DY,-9/32
                END   /CSINK
                ORIGIN/7.875,3.75
                DRAW  /CSINK
                DRAW  /MIRY(CSINK)
                FINI  /
```



2 1/2
2
1/4
1 1/8
11/16
1 1/16

SKETCH 17

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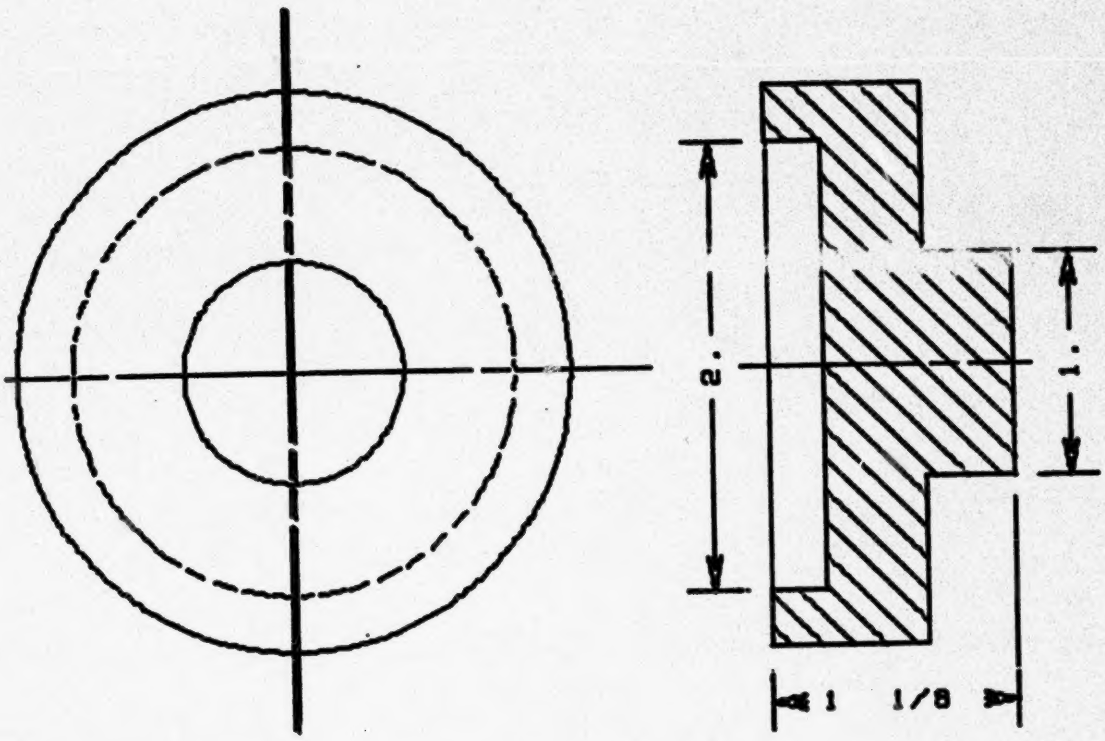

PLATE 17

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```
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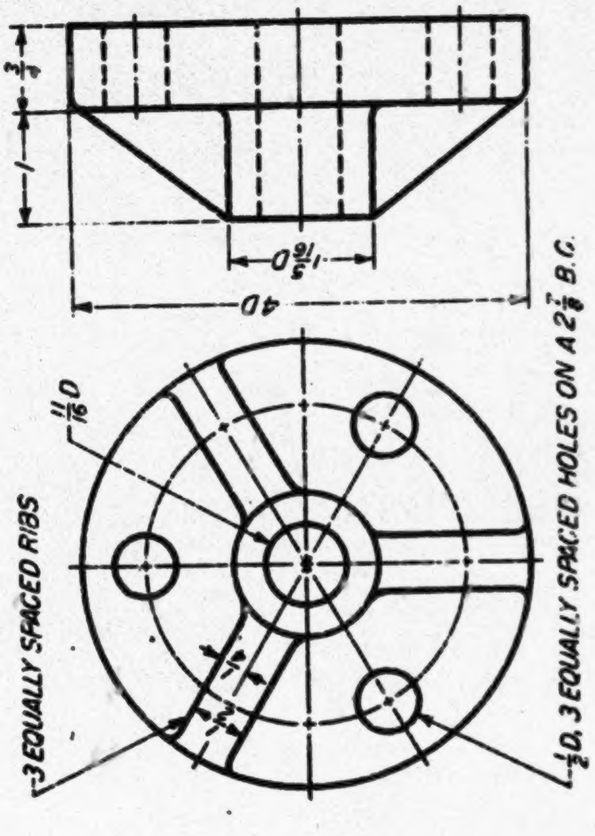
$$  PLATE 17           INTODUCTION TO CROSS HATCHING
  V1TOP    =         VIEW  /
                     ORIGIN/3.75,5.875
             CUTPL ,LINE  /0,-1.6,DY,3.2
             CTRLN ,LINE  /0,0,DX,-1.3
             CTRLN ,LINE  /0,0,DX,1.6
             CTRLN ,LINE  /2,0,DX,1.3
                     CIRCLE/0,0,.5
             DOTTED,CIRCLE/0,0,1
                     CIRCLE/0,0,1.25
                     END   /V1TOP
                     DRAW  /V1TOP
  V1SEC    =         VIEW  /
  P1       =         PT    /2.125,1
                     LINE  /P1 ,DY,.25
  P2       =         PT    /PPP
                     LINE  /PPP,DX,.7
  P3       =         PT    /PPP
                     LINE  /PPP,DY,-.75
                     LINE  /PPP,DX,.4
  P4       =         PT    /PPP
  L1       =         LINE  /PPP,DY,-1
  P5       =         PT    /PPP
                     LINE  /PPP,DX,-.4
                     LINE  /PPP,DY,-.75
  P6       =         PT    /PPP
  L3       =         LINE  /PPP,DX,-.7
  P7       =         PT    /PPP
                     LINE  /PPP,DY,.25
  P8       =         PT    /PPP
                     LINE  /PPP,DX,.25
  P9       =         PT    /PPP
                     LINE  /PPP,DY,2
  P10      =         PT    /PPP
  L4       =         LINE  /PPP,P1
                     END   /V1SEC
                     DRAW  /V1SEC
                     HATCHP/135,.1,0,0
                     HATCH /V1SEC
                     MASK  /@PF08TN@
                     DIMST /XLARGE,YCOMP,L1,.25
                     DIMP  /.5,.1,1,1
                     DIM   /P5,P4
                     MASK  /@PF00TN@
                     DIMST /XSMALL,YCOMP,P1,P8,.25
                     DIM   /P1,P8
                     MASK  /@PF16TN@
                     DIMST /YSMALL,XCOMP,L3,.25
                     DIMP  /L3
                     DIMP  /.5,.1,1,1
                     DIM   /P7,P5
  V        =         VIEW  /
```

```
LINE  /P1,DY,-2
END   /V
DRAW  /V
FINI  /
```



3/4
1
1 5/16 D
4 D
11/16 D
3 EQUALLY SPACED RIBS
1/4
3/4
1/2 D, 3 EQUALLY SPACED HOLES ON A 2 7/8 B.C.

SKETCH 18

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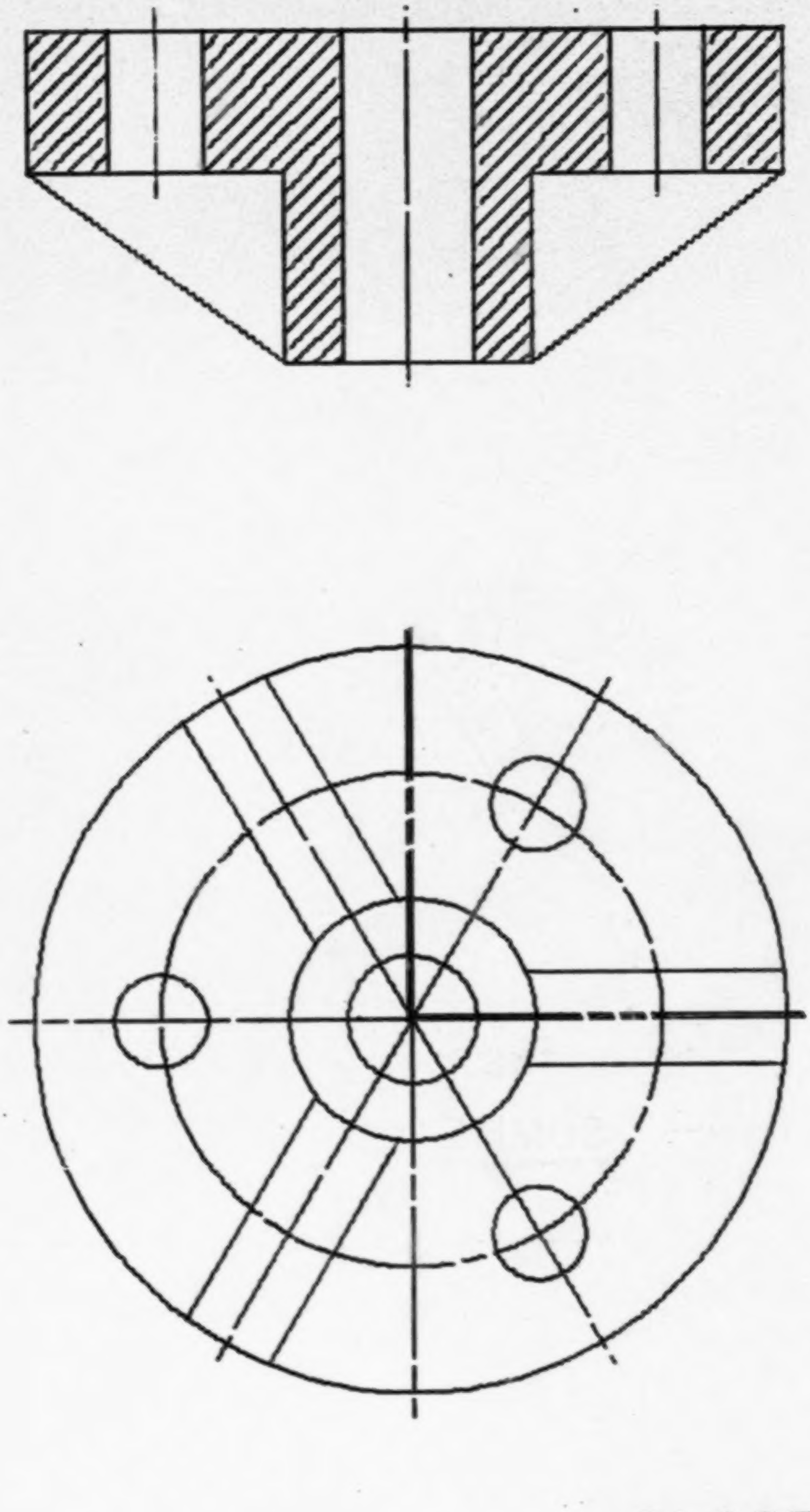

PLATE 18

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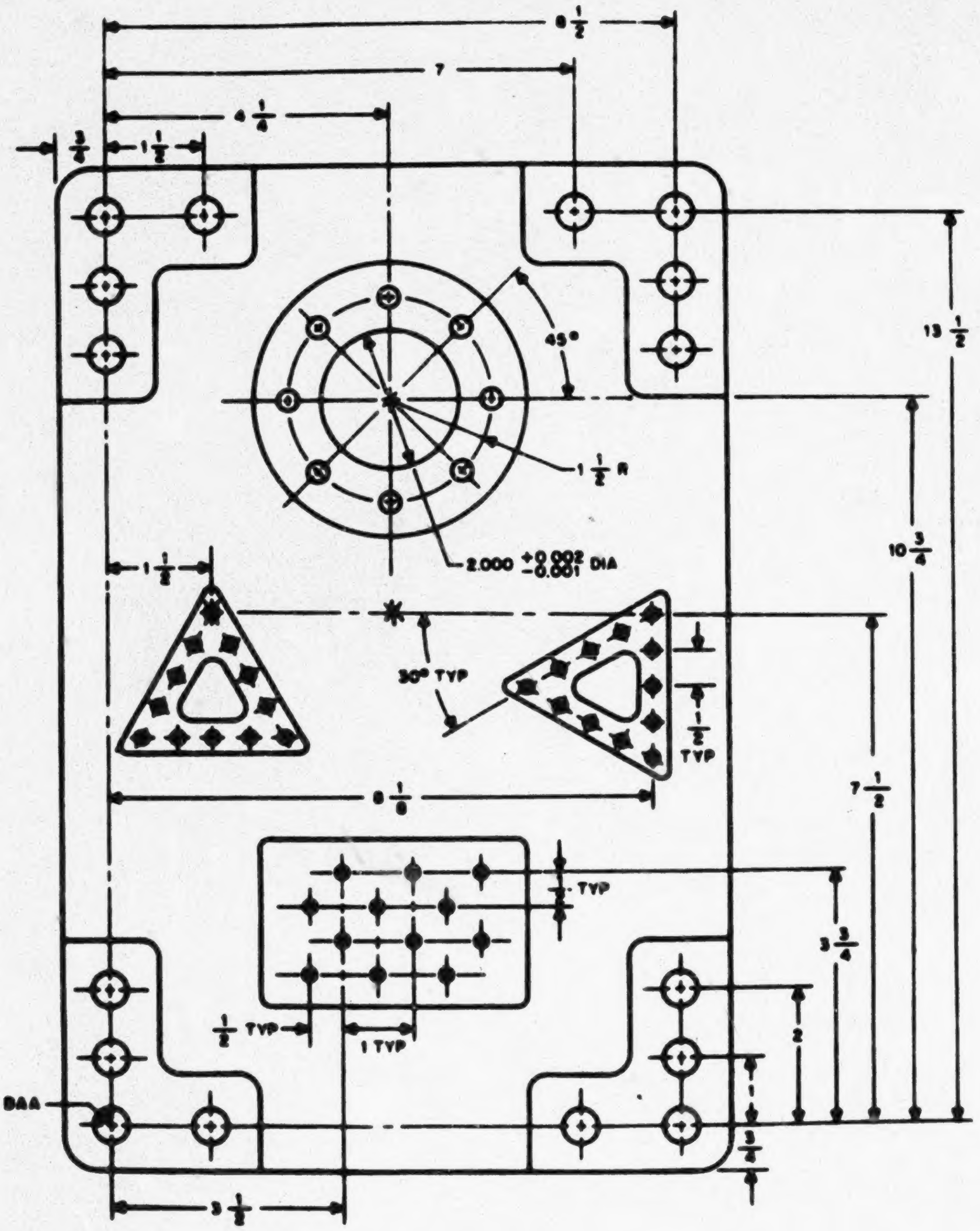
```
$$  PLATE 18                HATCHING A SHAFT GUIDE    (LONG -X-)
                     ALPHAP/(.2,.2,0,-.2),(0,0,0,270)
                     TITLE /1.5,2.5,@PLATE 18@
  SHAFT    =         VIEW  /
                     ORIGIN/4.25,3.75
  C1       =         CR    /0,0,11/32
  C2       =         CR    /0,0,21/32
  C3       =         CR    /0,0,2
  C4       =CTRLN ,CR      /0,0,1+21/64
  CNTERY   =CUTPL ,LN      /0,0,ATANGL,270,LENGTH,2.125
  LNR      =CONSTR,LN      /XLARGE,PARLEL,CNTERY,.25
  LNL      =CONSTR,LN      /XSMALL,PARLEL,CNTERY,.25
  PRR1     =         PT    /YSMALL,INTOF,LNR,C2
  PRR2     =         PT    /YSMALL,INTOF,LNR,C3
  PRL1     =         PT    /YSMALL,INTOF,LNL,C2
  PRL2     =         PT    /YSMALL,INTOF,LNL,C3
                     LN    /PRR1,PRR2
                     LN    /PRL2,PRL1
                     LOOPST/
  N=30
1)CNTER1   =CTRLN ,LN      /0,0,ATANGL,N,LENGTH,2.125
  LNRIGT   =CONSTR,LN      /XLARGE,PARLEL,CNTER1,.25
  PRGT1    =         PT    /YLARGE,INTOF,LNRIGT,C2
  PRGT2    =         PT    /YLARGE,INTOF,LNRIGT,C3
                     LN    /PRGT1,PRGT2
  N=N+120
  IF(N-150)1,1,2
  2)                 LOOPND/
                     LOOPST/
  N=30
1)CNTERX   =CONSTR,LN      /0,0,ATANGL,N,LENGTH,2.125
  LNLEFT   =CONSTR,LN      /XSMALL,PARLEL,CNTERX,.25
  PLFT1    =         PT    /YLARGE,INTOF,LNLEFT,C2
  PLFT2    =         PT    /YLARGE,INTOF,LNLEFT,C3
                     LN    /PLFT1,PLFT2
  N=N+120
  IF(N-150)1,1,2
  2)                 LOOPND/
                     LOOPST/
  N=210
1)L3       =CTRLN ,LN      /0,0,ATANGL,N,LENGTH,2.125
  P5       =         PT    /YSMALL,INTOF,L3,C4
                     CR    /P5,.25
  N=N+120
  IF(N-330)1,1,2
  2)                 LOOPND/
  LX4      =CTRLN ,LN      /0,0,ATANGL,90,LENGTH,2.125
  PX6      =         PT    /YLARGE,INTOF,LX4,C4
                     CR    /PX6,.25
           CTRLN ,LN       /0,0,DX,-2.125
           CUTPL ,LN       /0,0,DX,2.125
                     END   /SHAFT
```

```
                DRAW  /SHAFT
SHAFT1   =      VIEW  /
                LN    /3.5,21/32,DY,-21/16
P1       =      PT    /PPP
                LN    /PPP,DX,1
P2       =      PT    /PPP
                LN    /PPP,DY,-(2-21/32)
P3       =      PT    /PPP
                LN    /PPP,DX,3/4
P4       =      PT    /PPP
                LN    /PPP,DY,4
P5       =      PT    /PPP
                LN    /PPP,DX,-3/4
P6       =      PT    /PPP
                LN    /PPP,DY,-(2-21/32)
P7       =      PT    /PPP
                LN    /PPP,DX,-1
P8       =      PT    /PPP
P9       =      PT    /3.5,11/32
                LN    /P9,DX,1.75
P10      =      PT    /PPP
         CONSTR,LN    /PPP,DY,-11/16
P11      =      PT    /PPP
                LN    /P11,DX,-1.75
P12      =      PT    /PPP
                LN    /P1,P3
P13      =      PT    /4.5,-(1.75-43/64)
                LN    /P13,DX,.75
P14      =      PT    /PPP
         CONSTR,LN    /P14,DY,-.5
P15      =      PT    /PPP
                LN    /P15,DX,-.75
P16      =      PT    /PPP
P17      =      PT    /4.5,(1.75-43/64)
                LN    /P17,DX,.75
P18      =      PT    /PPP
         CONSTR,LN    /P18,DY,.5
P19      =      PT    /PPP
                LN    /P19,DX,-.75
P20      =      PT    /PPP
                LN    /P6,P8
         CTRLN ,LN    /3.375,0,DX,2.0
         CTRLN ,LN    /4.375,-(2-43/64),DX,1.0
         CTRLN ,LN    /4.375,(2-43/64),DX,1.0
                END   /SHAFT1
                DRAW  /SHAFT1
SHAFT2   =      VIEW  /
         CONSTR,LN    /P15,P16
         CONSTR,LN    /P16,P3
         CONSTR,LN    /P3,P4
         CONSTR,LN    /P4,P15
         CONSTR,LN    /P10,P18
         CONSTR,LN    /P18,P17
         CONSTR,LN    /P17,P7
         CONSTR,LN    /P7,P8
```

```
          CONSTR,LN    /P8,P9
          CONSTR,LN    /P9,P10
                 END   /SHAFT2
                 DRAW  /SHAFT2
                 HATCHP/135,.075,0,0
                 HATCH /SHAFT2
SHAFT3  =        VIEW  /
          CONSTR,LN    /P20,P19
          CONSTR,LN    /P19,P5
          CONSTR,LN    /P5,P6
          CONSTR,LN    /P6,P20
          CONSTR,LN    /P12,P11
          CONSTR,LN    /P11,P14
          CONSTR,LN    /P14,P13
          CONSTR,LN    /P13,P2
          CONSTR,LN    /P2,P1
          CONSTR,LN    /P1,P12
                 END   /SHAFT3
                 DRAW  /SHAFT3
                 HATCHP/135,.075,0,0
                 HATCH /SHAFT3
                 FINI  /
```


8 1/2
7
4 1/4
3/4
1 1/2
45°
13 1/2
1 1/2 R
2.000 +0.002 −0.001 DIA
10 3/4
1 1/2
30° TYP
1/2 TYP
7 1/2
8 1/8
TYP
3 3/4
2
1/2 TYP
1 TYP
DAA
3/4
3 1/2

SKETCH 19

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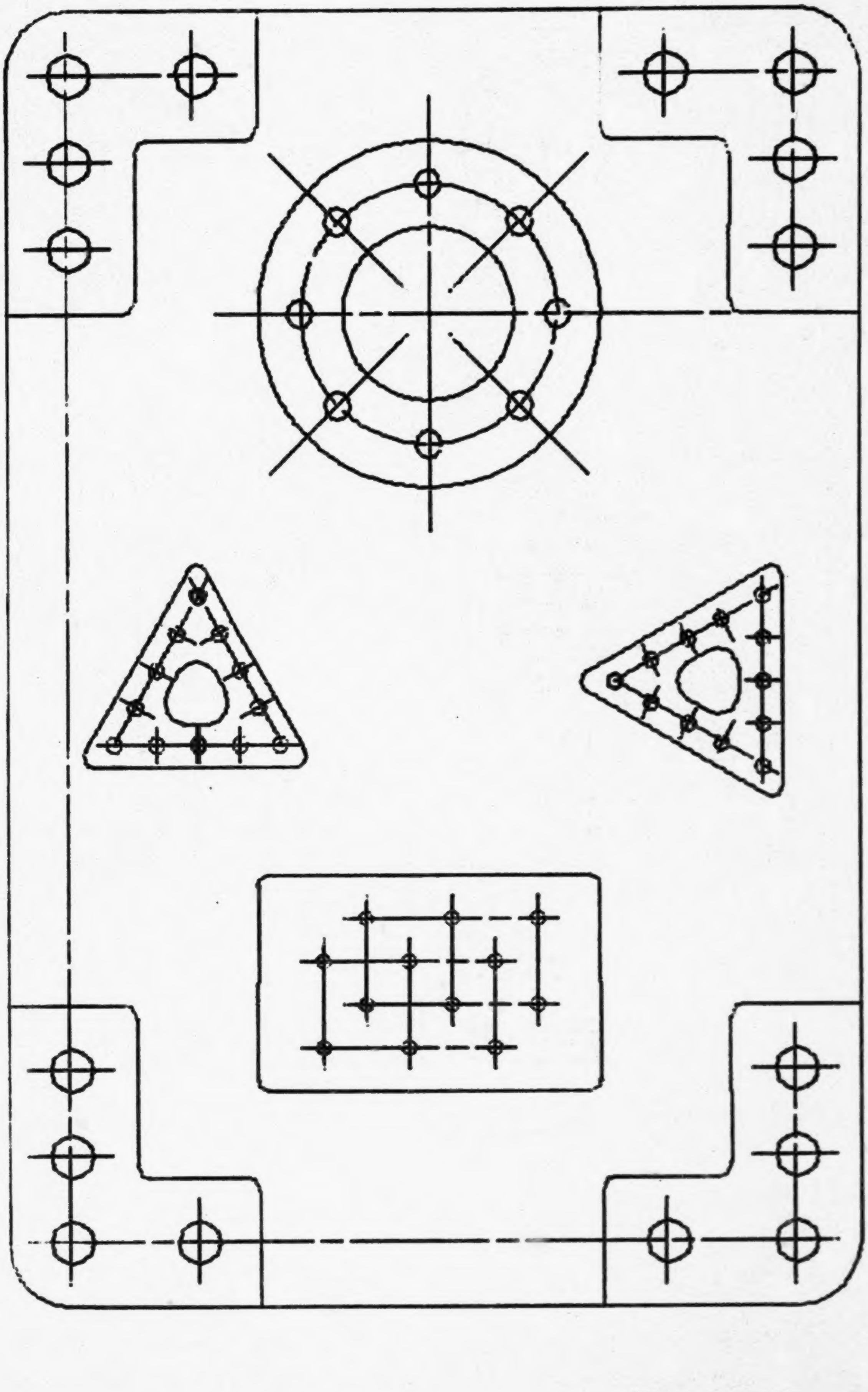

PLATE 19

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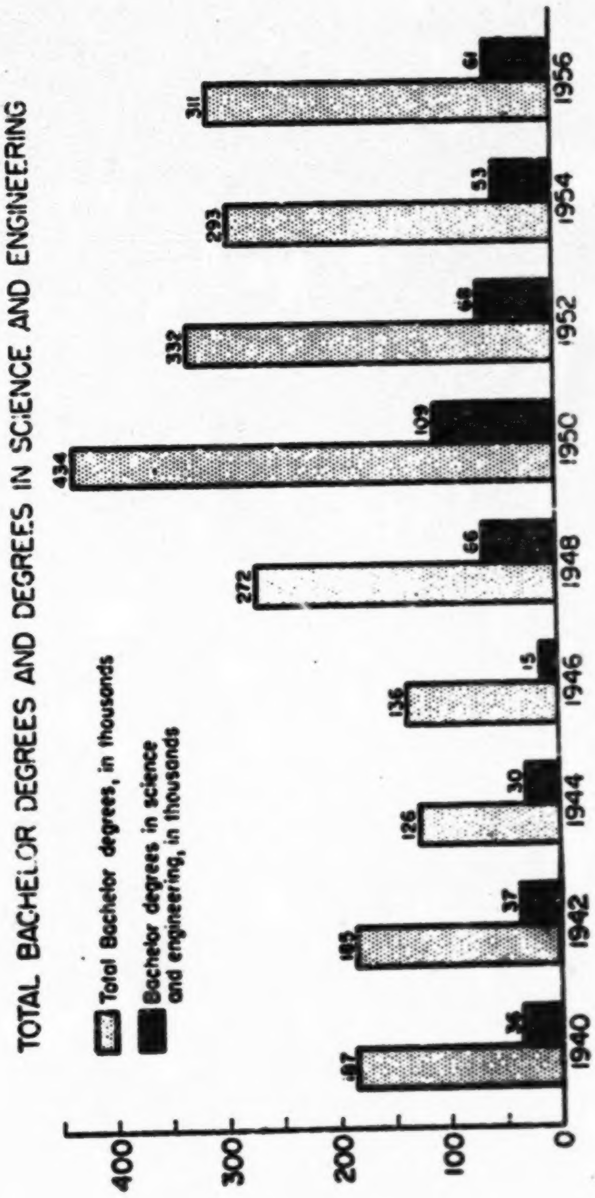
```
                              *****  1967 SUMMER INSTITUTE


$$  PLATE 19                        MOUNTING PLATE
                              ALPHAP/(.2,.2,.2,0),(0,0,0,0)
                              TITLE /6,1.5,@PLATE 19@
                              SCALE /.5
  FRAMEX  =                   VIEW  /
                              LINE  /01,0,DX,9
                              ARC   /0.75
                              LINE  /DY,15
                              ARC   /0.75
                              LINE  /DX,-10
                              ARC   /0.75
                              LINE  /DY,-15
                              ARC   /0.75
                              LINE  /DX,1
                              END   /FRAMEX
                              ORIGIN/2.25,2.125
                              DRAW  /FRAMEX
  CORNER  =                   VIEW  /
                              LINE  /2,7.5,DY,-1.50
                              ARC   /5/32
                              LINE  /DX,1.5
                              ARC   /5/32
                              LINE  /DY,-2
                              ARC   /5/32
                              LINE  /DX,1.5
                              END   /CORNER
                              ORIGIN/4.75,5.875
                              DRAW  /CORNER
                              DRAW  /MIRX(CORNER)
                              DRAW  /MIRY(CORNER)
                              DRAW  /MIRXY(CORNER)
  CHOLE   =CTRLN ,VIEW  /
                              LINE  /0,-.5,DY,14.5
                              LINE  /-.5,13.5,DX,2.5
                              LINE  /7-1/2,13.5,DX,2.5
                              LINE  /9,12.5,DX,-1
                              LN    /1/2,12.5,DX,-1
                              LN    /-1/2,11.5,DX,1
                              LN    /8,11.5,DX,1
                              LN    /9,2,DX,-1
                              LN    /1/2,2,DX,-1
                              LN    /-1/2,1,DX,1
                              LN    /8,1,DX,1
                              LN    /9,0,DX,-9.5
                              LN    /1.5,-1/2,DY,1
                              LN    /7,1/2,DY,-1
                              LN    /8.5,-1/2,DY,3
                              LN    /8.5,11,DY,3
                              LN    /7,14,DY,-1
                              LN    /1.5,13,DY,1
                              END   /CHOLE
                              ORIGIN/2.615,2.5
```

```
                DRAW  /CHOLE
SMLCIR  =       VIEW  /
                ORIGIN/4.75,5.875
                CIRCLE/4.25,6.75,.25
                CIRCLE/4.25,5.75,.25
                CIRCLE/4.25,4.75,.25
                CIRCLE/2.75,6.75,.25
                END   /SMLCIR
                DRAW  /SMLCIR
                DRAW  /MIRX(SMLCIR)
                DRAW  /MIRY(SMLCIR)
                DRAW  /MIRXY(SMLCIR)
LGCIR   =       VIEW  /
                ORIGIN/4.75,7.875
                CIRCLE/0,0,1.
                CIRCLE/0,0,2.
  C1    =CTRLN ,CIRCLE/0,0,1.5
         CTRLN ,LN    /0,-2.5,DY,5.
         CTRLN ,LN    /-2.5,0,DX,6.
                END   /LGCIR
                DRAW  /LGCIR
LGCIRL  =       VIEW  /
                ORIGIN/4.75,7.875
  L1    =CTRLN ,LN    /.25,.25,ATANGL,45,LENGTH,2.25
                END   /LGCIRL
                DRAW  /LGCIRL
                DRAW  /MIRX(LGCIRL)
                DRAW  /MIRY(LGCIRL)
                DRAW  /MIRXY(LGCIRL)
  CIRMIR=       VIEW  /
                ORIGIN/4.75,7.875
                CIRCLE/(POINT/XLARGE,INTOF,L1,C1),.3125/2
                END   /CIRMIR
                DRAW  /CIRMIR
                DRAW  /MIRX(CIRMIR)
                DRAW  /MIRY(CIRMIR)
                DRAW  /MIRXY(CIRMIR)
  CIRTOP=       VIEW  /
                ORIGIN/3.75,7.875
                CIRCLE/2,1.5,.3125/2
                END   /CIRTOP
                DRAW  /CIRTOP
                DRAW  /MIRY(CIRTOP)
  CIRSID=       VIEW  /
                ORIGIN/4.75,6.875
                CIRCLE/1.5,2,.3125/2
                END   /CIRSID
                DRAW  /CIRSID
                DRAW  /MIRX(CIRSID)
  BOX   =       VIEW  /
                ORIGIN/2.615,2.5
                LN    /2.375,1.750,DX,3.875
                ARC   /.125
                LN    /DY,2.5
                ARC   /.125
```

```
              LN    /DX,-4.
              ARC   /.125
              LN    /DY,-2.5
              ARC   /.125
              LN    /DX,.125
       CTRLN ,LN    /2.75,2.25,DX,2.5
       CTRLN ,LN    /2.75,3.25,DX,2.5
       CTRLN ,LN    /3.25,2.75,DX,2.5
       CTRLN ,LN    /3.25,3.75,DX,2.5
              END   /BOX
              DRAW  /BOX
BOXCIR=       VIEW  /
              ORIGIN/3.75,4.125
              CIRCLE/1.25,.5,.152/2
              CIRCLE/2.25,.5,.152/2
              CIRCLE/3.25,.5,.152/2
              LN    /1.25,.75,DY,-.75
              LN    /2.25,.75,DY,-.75
              LN    /3.25,.75,DY,-.75
              END   /BOXCIR
              DRAW  /BOXCIR
              DRAW  /MIRY(BOXCIR)
BIXSIR=       VIEW  /
              ORIGIN/3.75,3.875
              CIRCLE/.75,.5,.152/2
              CIRCLE/1.75,.5,.152/2
              CIRCLE/2.75,.5,.152/2
              LN    /.75,.75,DY,-.75
              LN    /1.75,.75,DY,-.75
              LN    /2.75,.75,DY,-.75
              END   /BIXSIR
              DRAW  /BIXSIR
              DRAW  /MIRY(BIXSIR)
LFTRI =       VIEW  /
              ORIGIN/3.375,5.3845
L2    =CTRLN ,LN    /0,0,DX,1.2
L3    =CTRLN ,LN    /1,0,ATANGL,120,TILLX,-.173
        CONSTR,LN   /1,0,ATANGL,320,TILLY,-.1
              LN    /0,-.2,DY,.4
              LN    /.5,-.2,DY,.4
              CR    /0,0,.164/2
              CR    /.5,0,.164/2
              CR    /1,0,.164/2
L4    =CONSTR,LN    /-.5,0,ATANGL,60,TILLY,7.5
L5    =CONSTR,LN    /0,0,ATANGL,60,TILLY,7.5
L6    =CONSTR,LN    /.5,0,ATANGL,60,TILLY,7.5
              CR    /(POINT/XLARGE,INTOF,L3,L4),.164/2
              CR    /(POINT/XLARGE,INTOF,L3,L5),.164/2
              CR    /(POINT/XLARGE,INTOF,L3,L6),.164/2
              CR    /0,SQRT(3),.164/2
        CONSTR,LN   /(POINT/XLARGE,INTOF,L3,L4),ATANGL,$
                     30,TILLX,.423
              LN    /PPP,ATANGL,210,TILLX,.047
        CONSTR,LN   /(POINT/XLARGE,INTOF,L3,L5),ATANGL,$
                     30,TILLX,.673
              LN    /PPP,ATANGL,210,TILLX,.327
       CONSTR,LN    /(POINT/XLARGE,INTOF,L3,L6),ATANGL,$
                     30,TILLX,.923
              LN    /PPP,ATANGL,210,TILLX,.547
              END   /LFTRI
              DRAW  /LFTRI
              DRAW  /MIRX(LFTRI)
LFFIN=        VIEW  /
              ORIGIN/2.615,2.5
              LN    /.5,5.517,DX,2.4325
              ARC   /.125
              LN    /PPP,ATANGL,120,TILLX,1.5
              ARC   /.125
              LN    /PPP,ATANGL,240,TILLY,5.517
              ARC   /.125
              LN    /DX,.55
              LN    /1.333,6.017,DX,.7345
              ARC   /.25
              LN    /PPP,ATANGL,120,TILLX,1.5
              ARC   /.25
              LN    /PPP,ATANGL,240,TILLY,6.017
              ARC   /.25
              LN    /DX,.4005
              END   /LFFIN
              DRAW  /LFFIN
RGTRI  =      VIEW  /
              ORIGIN/5.82135,5.75
L7     =CTRLN ,LN   /0,0,ATANGL,30,TILLY,1.1
L8     =CTRLN ,LN   /SQRT(3),1.2,DY,-1.2
              CR    /0,0,.082
L9     =      LN    /.3325,.423,ATANGL,300,TILLX,.5325
              CR    /(POINT/XLARGE,INTOF,L7,L9),.082
L10    =      LN    /.765,.673,ATANGL,300,TILLX,.965
              CR    /(POINT/XLARGE,INTOF,L7,L10),.082
L11    =      LN    /1.1975,.823,ATANGL,300,TILLX,1.3975
              CR    /(POINT/XLARGE,INTOF,L7,L11),.082
              CR    /(POINT/XLARGE,INTOF,L7,L8),.082
L12    =      LN    /SQRT(3)-.2,.5,DX,.4
              CR    /(POINT/XLARGE,INTOF,L8,L12),.082
L13    =      LN    /SQRT(3)-.2,0,DX,.4
              CR    /(POINT/XLARGE,INTOF,L8,L13),.082
              END   /RGTRI
              DRAW  /RGTRI
              DRAW  /MIRY(RGTRI)
RGFIN  =      VIEW  /
              ORIGIN/2.615,2.5
              LN    /6.3927,6.5+.25/SIND(60),ATANGL,30,$
                     TILLX,8.375
              ARC   /.125
              LN    /DY,-2.865
              ARC   /.125
              LN    /PPP,ATANGL,150,TILLY,6.5
              ARC   /.125
              LN    /PPP,ATANGL,30,TILLX,6.3927
              LN    /7.25,.3575*SIND(30)/COSD(30)+6.5,$
```

```
          ATANGL,30,TILLX,7.875
ARC     /.25
LN      /PPP,ATANGL,270,TILLY,$
         .25*COSD(30)/SIND(30)+5.5
ARC     /.25
LN      /PPP,ATANGL,150,TILLX,6.8927
ARC     /.25
LN      /PPP,ATANGL,30,TILLX,7.2500
END     /RGFIN
DRAW    /RGFIN
FINI/
```



SKETCH 20

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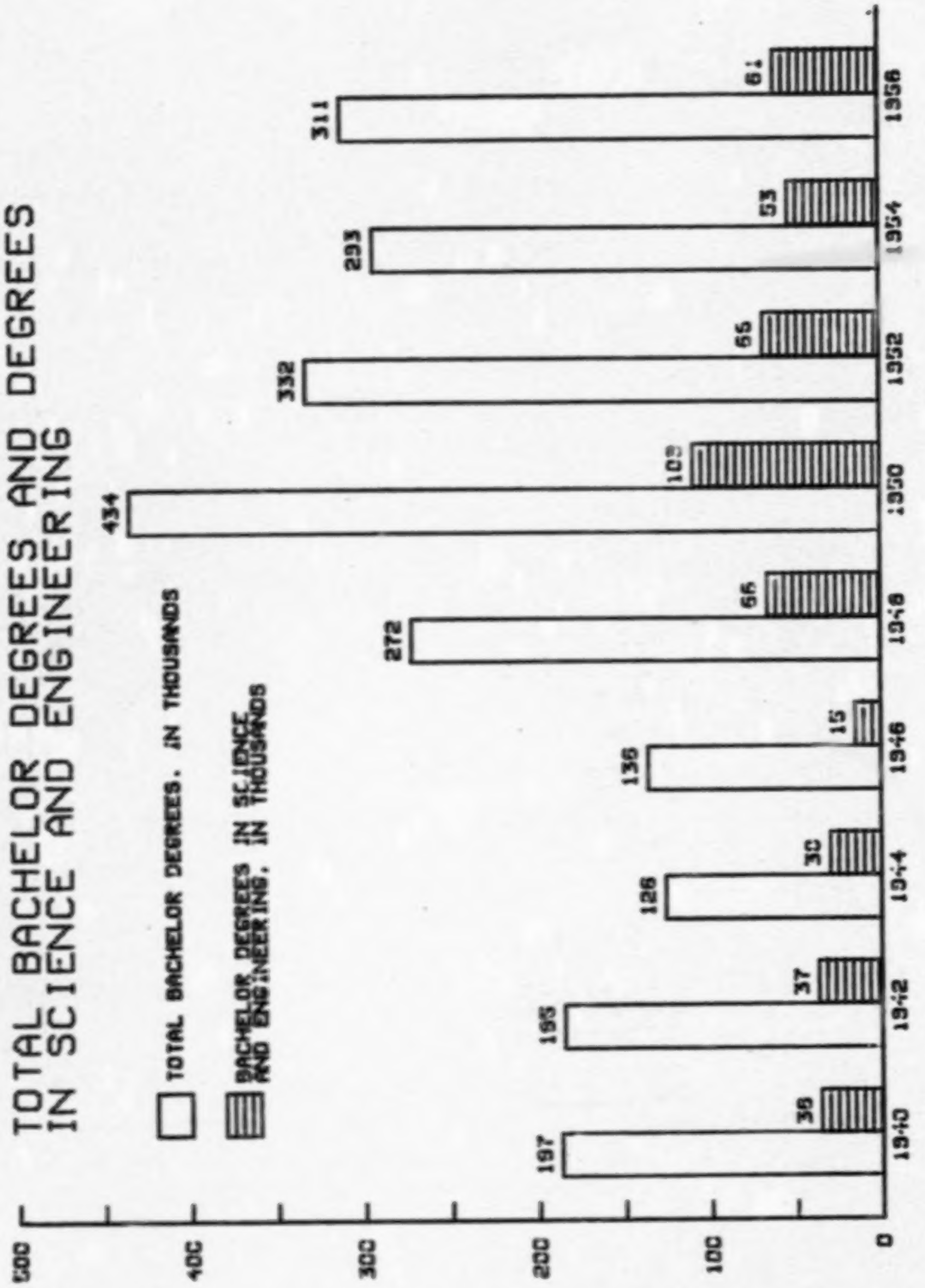

TOTAL BACHELOR DEGREES AND DEGREES IN SCIENCE AND ENGINEERING

PLATE 20

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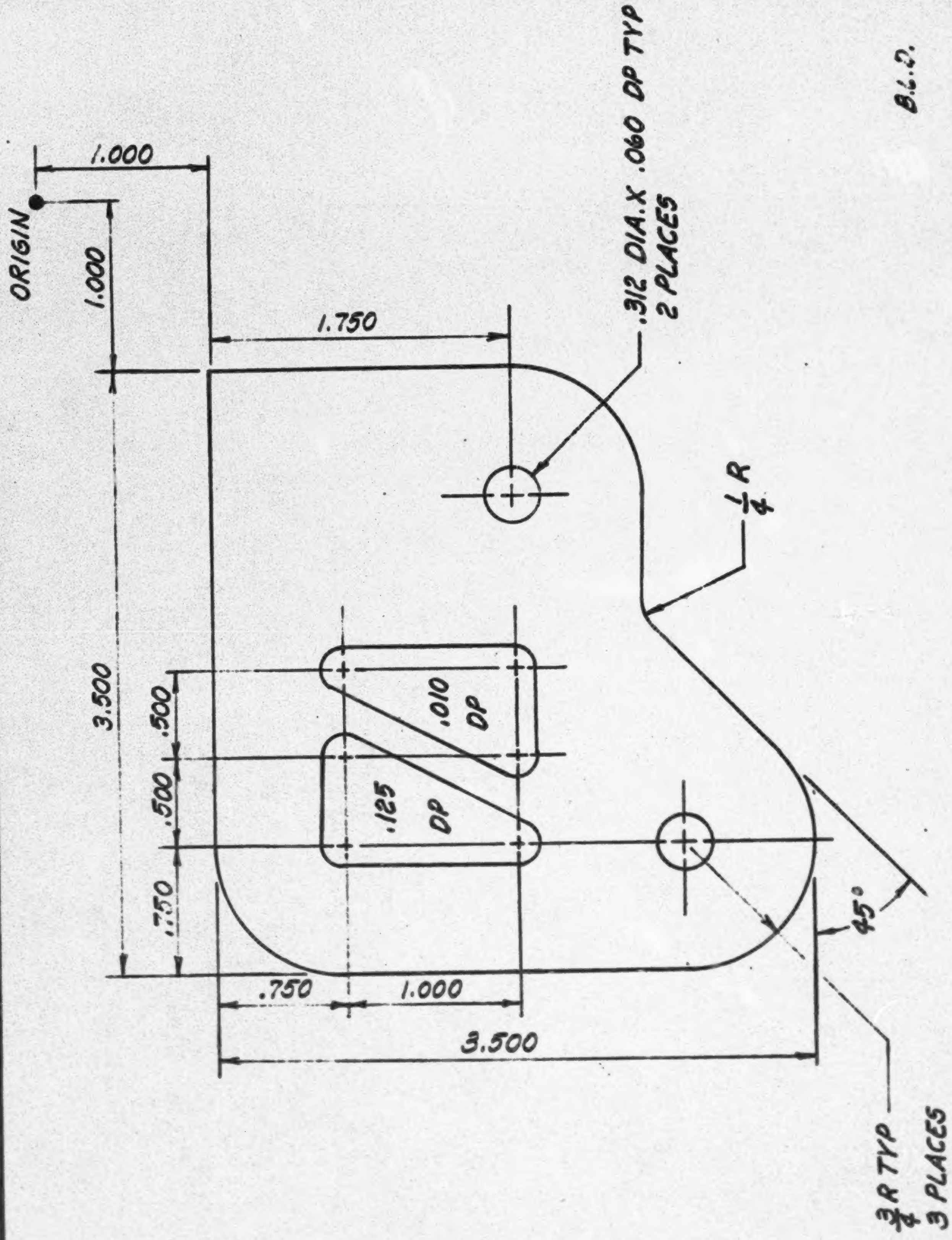
MIAMI-DADE JUNIOR COLLEGE

```
$$PLATE 20          BAR GRAPH USING TWO MACROS
CALL/REFAX,,XLEN=7,,YLEN=5,,XUN=0,,YUN=.5,,OR=PT/2.5,1.5
ALPHAP/(.2,.2,.16,0),(0,-.2,0,0)
NOTE/.55,4.95,@TOTAL BACHELOR DEGREES AND DEGREES@,$
@IN SCIENCE AND ENGINEERING@
CALL/RECT,,X=.25,,Y=1.87,,ORX=.375,,OPT=0,,F=.1,,N=3,,LIT=@187@
CALL/RECT,,Y=1.85,,ORX=1.125,,LIT=@185@
CALL/RECT,,Y=1.26,,ORX=1.875,,LIT=@126@
CALL/RECT,,Y=1.36,,ORX=2.625,,LIT=@136@
CALL/RECT,,Y=2.72,,ORX=3.375,,LIT=@272@
CALL/RECT,,Y=4.34,,ORX=4.125,,LIT=@434@
CALL/RECT,,Y=3.32,,ORX=4.875,,LIT=@332@
CALL/RECT,,Y=2.93,,ORX=5.625,,LIT=@293@
CALL/RECT,,Y=3.11,,ORX=6.375,,LIT=@311@
CALL/RECT,,Y=.61,,ORX=6.625,,OPT=1,,N=2,,LIT=@61@
CALL/RECT,,Y=.53,,ORX=5.875,,LIT=@53@
CALL/RECT,,Y=.68,,ORX=5.125,,LIT=@68@
CALL/RECT,,Y=1.09,,ORX=4.375,,N=3,,LIT=@109@
CALL/RECT,,Y=.66,,ORX=3.625,,N=2,,LIT=@66@
CALL/RECT,,Y=.15,,ORX=2.875,,LIT=@15@
CALL/RECT,,Y=.3,,ORX=2.125,,LIT=@30@
CALL/RECT,,Y=.37,,ORX=1.375,,LIT=@37@
CALL/RECT,,Y=.36,,ORX=.625,,LIT=@36@
ALPHAP/(.1,.1,.08,0),(0,0,0,0)
NOTE/-.3,0,@  0@
NOTE/-.3,1,@100@
NOTE/-.3,2,@200@
NOTE/-.3,3,@300@
NOTE/-.3,4,@400@
NOTE/-.3,5,@500@
NOTE/.35,-.1,@1940@
NOTE/1.1,-.1,@1942@
NOTE/1.85,-.1,@1944@
NOTE/2.6,-.1,@1946@
NOTE/3.35,-.1,@1948@
NOTE/4.1,-.1,@1950@
NOTE/4.85,-.1,@1952
NOTE/5.6,-.1,@1954@
NOTE/6.35,-.1,@1956@
ORIGIN/2.5,5.1
CALL/RECT,,Y=.2,,ORX=.625,,N=0
ALPHAP/(.1,.1,.08,0),(0,-.1,0,0)
NOTE/.85,.1,@BACHELOR DEGREES IN SCIENCE@,$
@AND ENGINEERING, IN THOUSANDS@
ORIGIN/2.5,5.5
CALL/RECT,,OPT=0
NOTE/.85,.1,@TOTAL BACHELOR DEGREES, IN THOUSANDS@
FINI/
```

```
REFAX=MACRO/XLEN,YLEN,XUN,YUN
DEFPT/OR
XYZ=VIEW/
ORIGIN/OR
XNOTCH=0
YNOTCH=0
LN/DY,YLEN
LN/DY,-YLEN
LN/DX,XLEN
LN/DX,-XLEN
LOOPST/
IF(YUN)2,2,1
1) YNOTCH=YNOTCH+YUN
LN/0,YNOTCH,DX,YUN/5
IF(YNOTCH-YLEN)1,2,2
2) IF(XUN)4,4,3
3) XNOTCH=XNOTCH+XUN
LN/XNOTCH,0,DY,-XUN/5
IF(XNOTCH-XLEN)3,4,4
4) LOOPND
END/XYZ
DRAW/XYZ
TERMAC/
```

```
RECT=MACRO/ORX,X,Y,OPT,N,F
DEFLT/LIT
ABC=VIEW/
REFSYS/ORX-X/2,0
LN/DY,Y
LN/,DX,X
LN/DY,-Y
LN/DX,-X
END/ABC
DRAW/ABC
ALPHAP/(F,F,.8*F,0),(0,0,0,0)
LOOPST/
IF(N)9,9,0
0) NOTE/X/2-.8*F*(N-1)/2,Y+F,LIT
9) IF(OPT)4,4,1
1) IF(OPT-1)4,2,3
2) HATCHP/0,.05,0,0
HATCH/ABC
JUMPTO/4
3) IF(OPT-2) 4,5,6
5) HATCHP/45,.05,0,0
HATCH/ABC
JUMPTO/4
6) IF(OPT-3)4,7,4
7) HATCHP/90,.05,0,0
HATCH/ABC
4) LOOPND
   REFSYS/NOMORE
TERMAC/
```


ORIGIN
1.000
1.000
1.750
.312 DIA. X .060 DP TYP
2 PLACES
B.L.D.
1/4 R
3.500
.500
.500
.750
.010
DP
.125
DP
45°
.750
1.000
3.500
3/4 R TYP
3 PLACES

SKETCH 21

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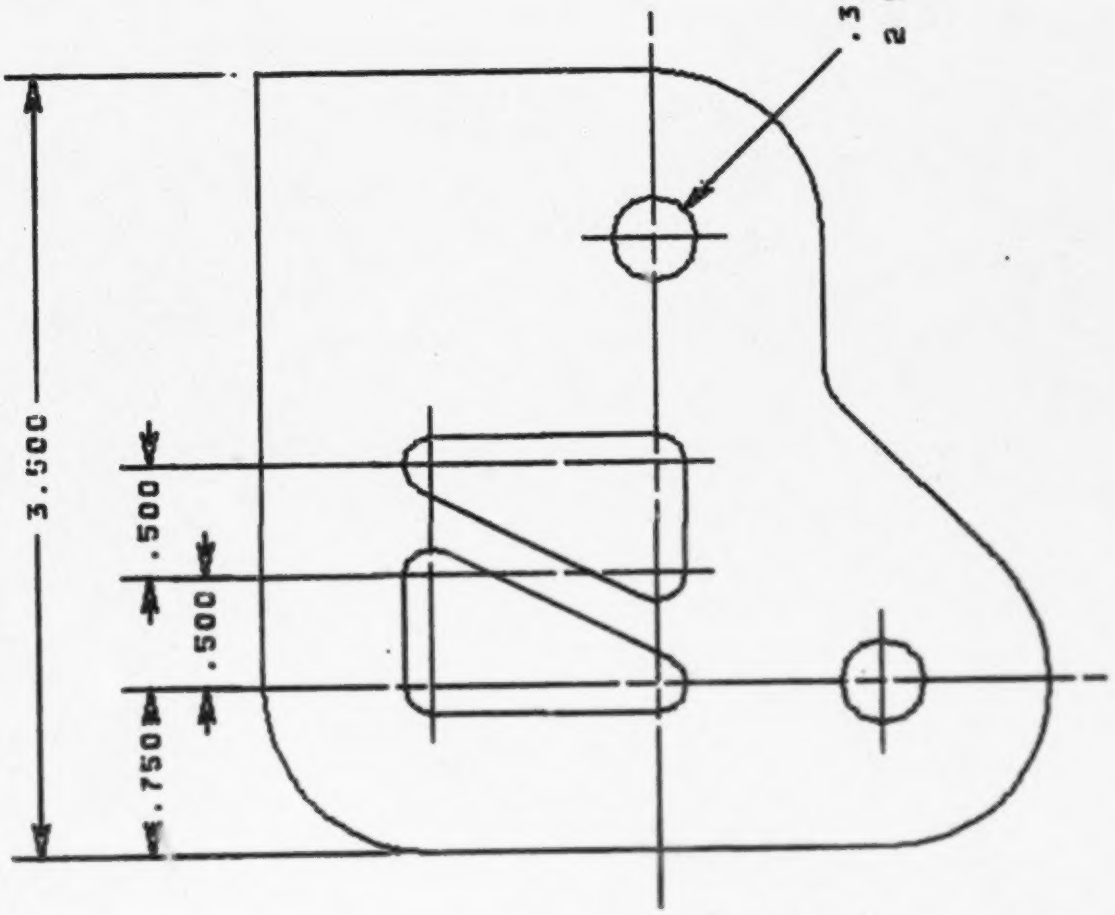
.312 DIA. X .060 DP TYP
2 PLACES
3.500
.500
.500
.750

PLATE 21

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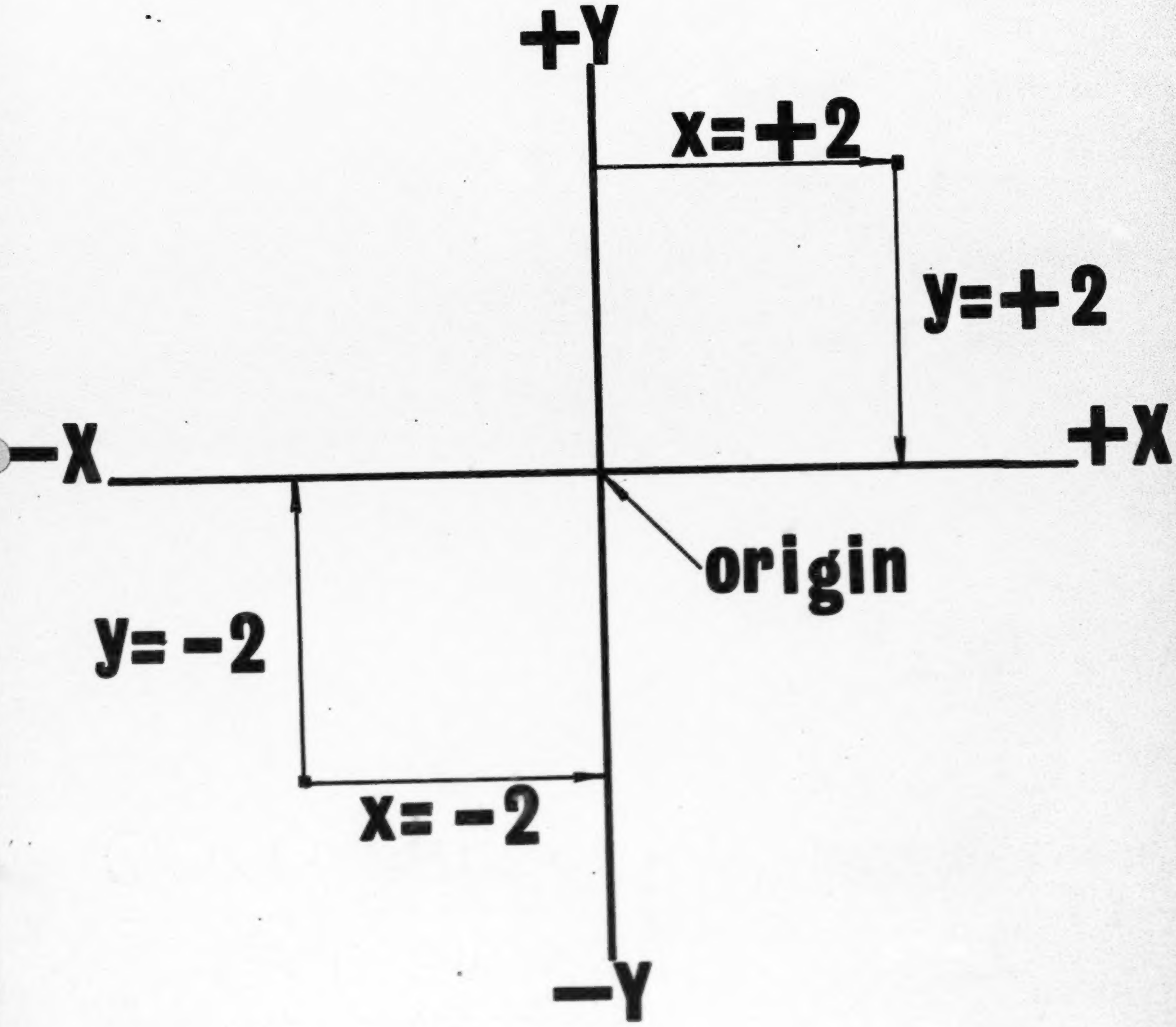
```
$$  PLATE 21          CONTINUOUS PATH MILLING
  BOX       =         VIEW  /
CALL/FRAME1,,X=10,,Y=6.5,,ORX=.5,,ORY=.5
                      END   /BOX
                      DRAW  /BOX
                      ALPHAP/(.2,.2,0,-.2),(0,0,0,270)
                      TITLE /1.5,2.5,@PLATE 21@
                      ORIGIN/8.69,6.5
   FRAME1   =         VIEW  /
   P17      =         PT    /-4.5,-1.69
   P18      =         PT    /-3.75,-1
   P19      =         PT    /-3.25,-1.625
   P20      =         PT    /-2.75,-1.625
   P0       =         PT    /-1,-1
   L3       =         LN    /P0,DX,-3.5
                      ARC   /.75
                      LN    /DY,-2.75
                      ARC   /-3.75,-3.75,.75,180,135
   P1       =         PT    /PPP
                      LN    /P0,DY,-1.75
   P4       =         PT    /PPP
                      ARC   /-1.75,-2.75,.75,0,-90
   P2       =         PT    /PPP
   L1       =CONSTR,LN      /P2,DX,-1
   L2       =CONSTR,LN      /P1,ATANGL,45,LENGTH,2
   P3       =         PT    /INTOF,L1,L2
                      LN    /P1,P3
                      ARC   /.25
                      LN    /P3,P2
                      END   /FRAME1
                      DRAW  /FRAME1
                      ORIGIN/8.69,6.5
   CONCIR   =         VIEW  /
   C5       =CONSTR,CIRCLE/-3.75,-1.75,.125
   C6       =CONSTR,CIRCLE/-3.75,-2.75,.125
   C7       =CONSTR,CIRCLE/-3.25,-1.75,.125
   C8       =CONSTR,CIRCLE/-3.25,-2.75,.125
   C9       =CONSTR,CIRCLE/-2.75,-2.75,.125
   C10      =CONSTR,CIRCLE/-2.75,-1.75,.125
   P5       =         PT    /-3.875,-2.25
   P6       =         PT    /-2.625,-2.25
                      LN    /P5,RIGHT,TANTO,C6
                      ARC   /.125
                      LN    /RIGHT,TANTO,C6,RIGHT,TANTO,C7
                      ARC   /.125
                      LN    /RIGHT,TANTO,C7,RIGHT,TANTO,C5
                      ARC   /.125
                      LN    /-3.875,-1.75,P5
                      LN    /P6,LEFT,TANTO,C9
                      ARC   /.125
                      LN    /LEFT,TANTO,C9,LEFT,TANTO,C8
                      ARC   /.125
```

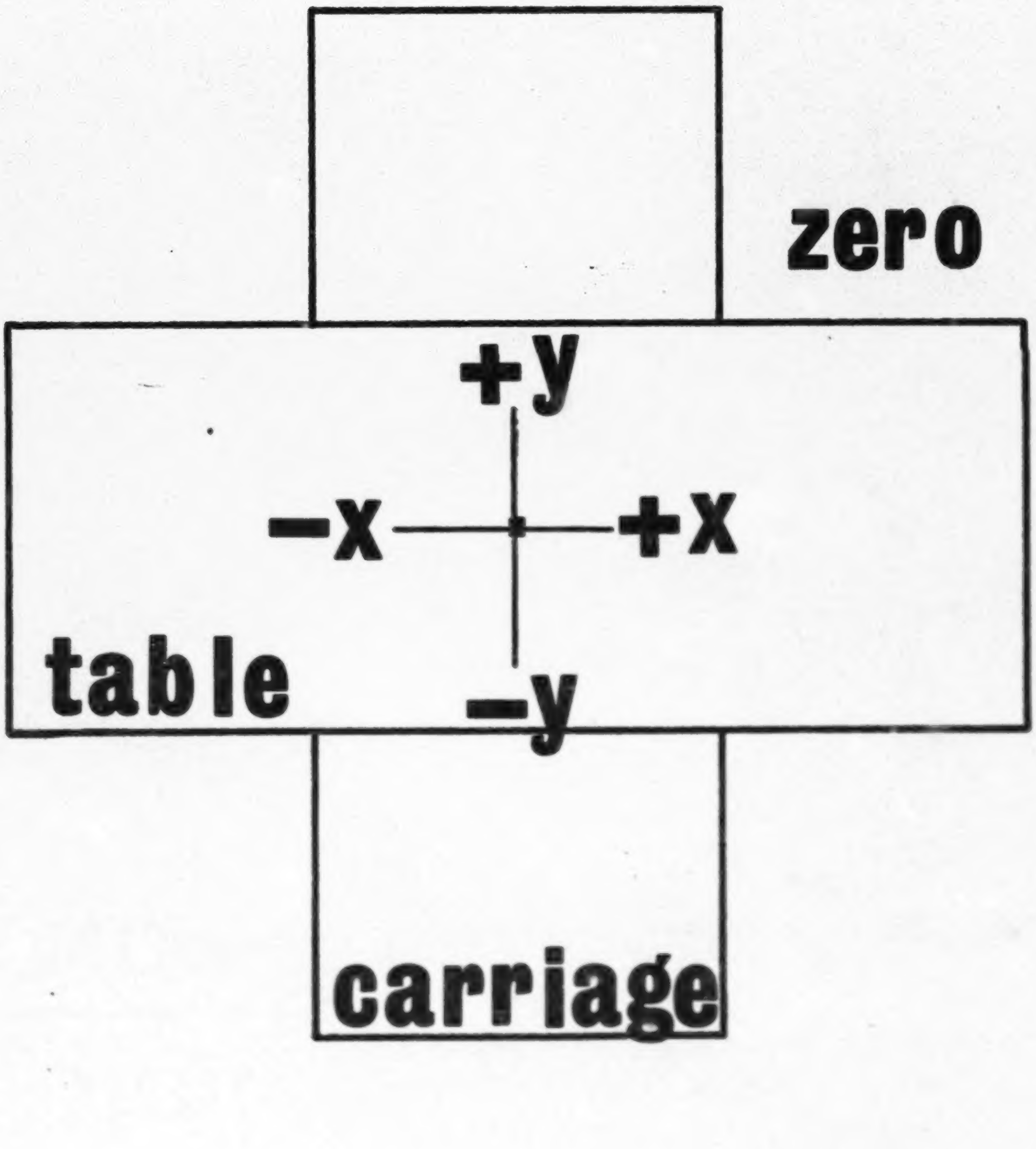
```
                LN    /LEFT,TANTO,C8,LEFT,TANTO,C10
                ARC   /.125
                LN    /-2.625,-1.75,P6
                CIRCLE/-1.75,-2.75,.187
                CIRCLE/-3.75,-3.75,.187
P11     =       PT    /-4.75,-2.75
         CTRLN ,LN    /P11,DX,4
P12     =       PT    /-4.062,-3.75
         CTRLN ,LN    /P12,DX,.624
P13     =       PT    /-4,-1.75
         CTRLN ,LN    /P13,DX,1.5
P14     =       PT    /-3.75,-.75
         CTRLN ,LN    /P14,DY,-4
P15     =       PT    /-2.75,-1.5
         CTRLN ,LN    /P15,DY,-1.5
P16     =       PT    /-1.75,-2.438
         CTRLN ,LN    /P16,DY,-.624
         CTRLN,LN     /-3.25,-1.5,DY,-1.5
                END   /CONCIR
                DRAW  /CONCIR
                DIMST /YLARGE,XCOMP,L3,.5
                DIMP  /.5,.1,1,1
                MASK  /@PD3TN@
                DIM   /P17,P18
                DIMST /YLARGE,XCOMP,L3,.5
                DIMP  /.5,.1,2,2
                DIM   /P19,P20
                DIMST /YLARGE,XCOMP,L3,.25
                DIMNN /P18,P19
                DIMST /YLARGE,XCOMP,L3,1
                DIMP  /.5,.1,1,1
                DIM   /L3
                ALPHAP/(.1,.1,.1,0),(0,-.2,0,0)
                NOTE  /-1.75+(SQRT(2)/2)*.187,-2.75-(SQRT(2)/2)*.187,$
                .75,-.75,@.312 DIA. X .060 DP TYP@,@2 PLACES@
                FINI  /
```

NUMERICAL CONTROL

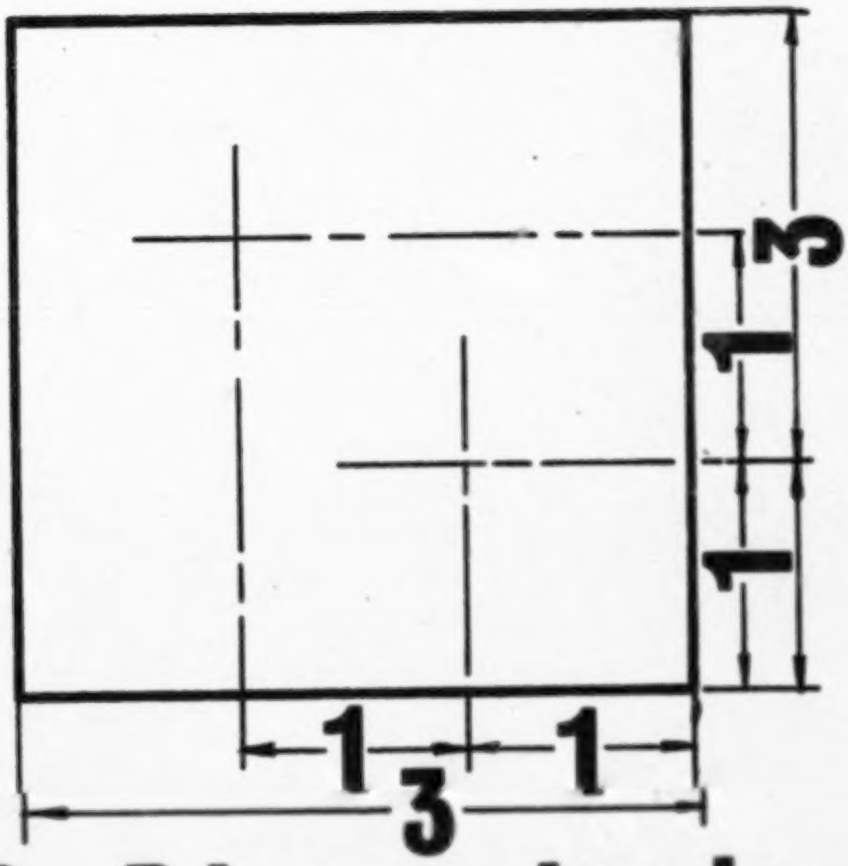
Coordinate System


+Y
x=+2
y=+2
−X
+X
origin
y=−2
x=−2
−Y

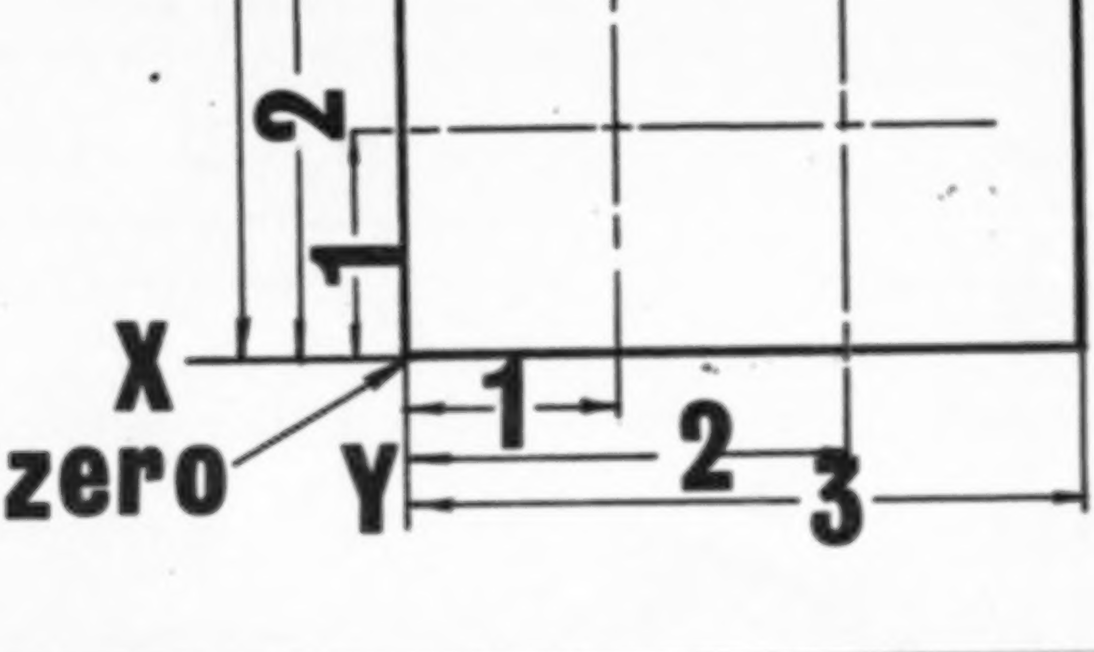
Coordinates of N.C. Machines


zero
+y
-x
+x
table
-y
carriage

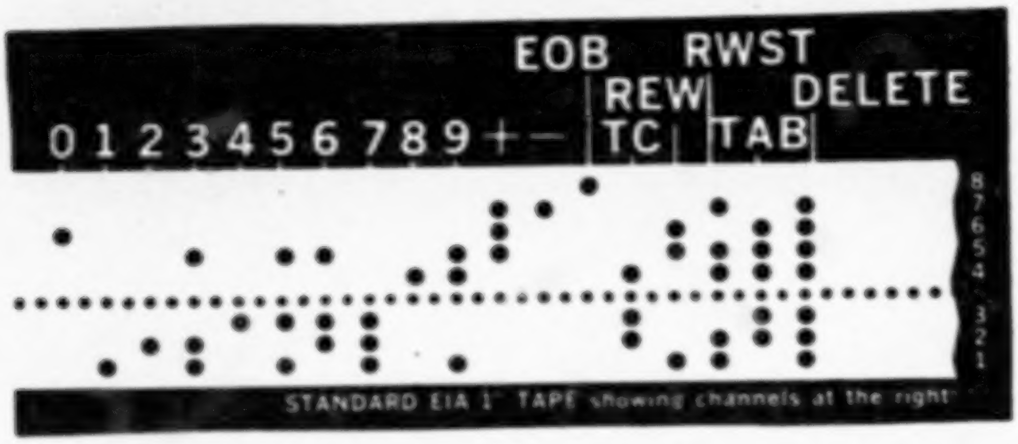
Conventional Drawing

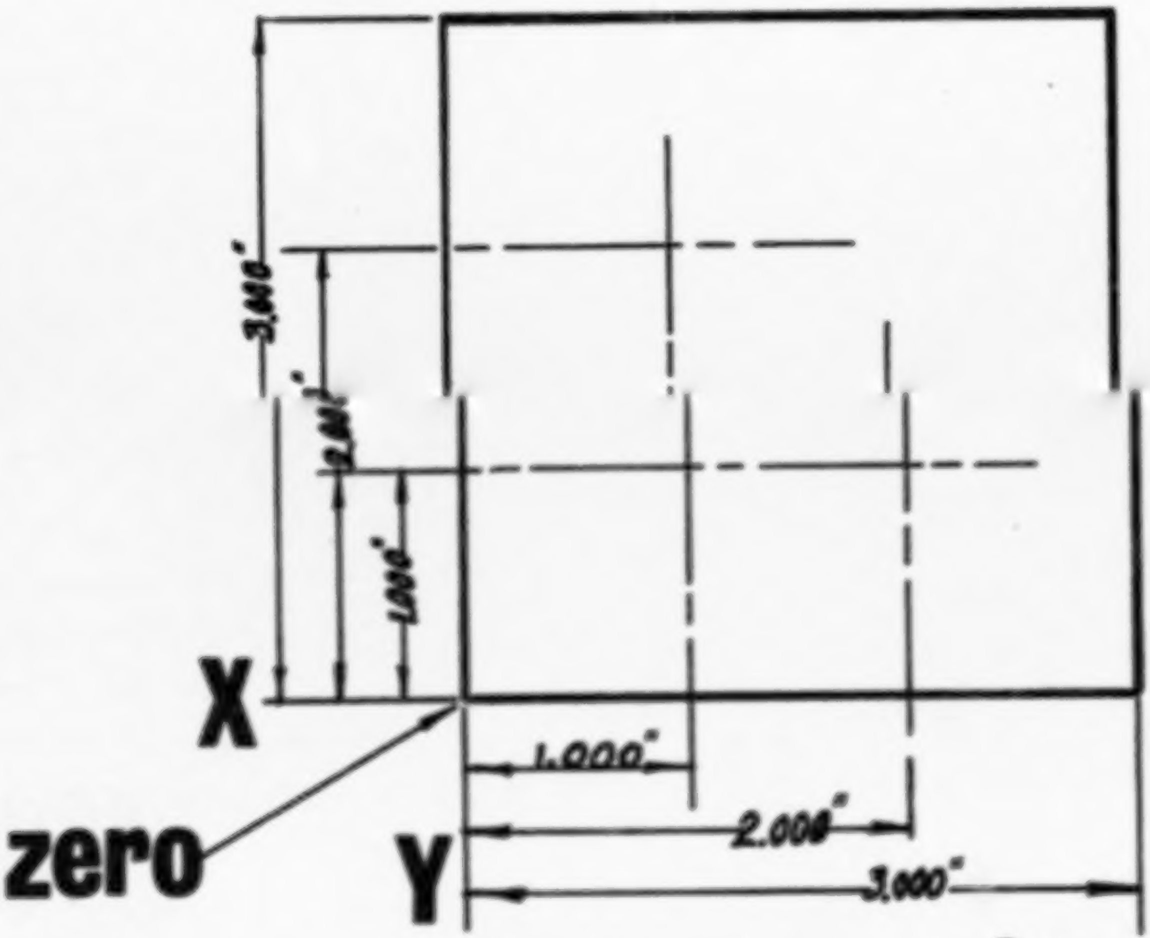


N.C. Dimensioning


3
2
1
X
zero
Y
1
2
3

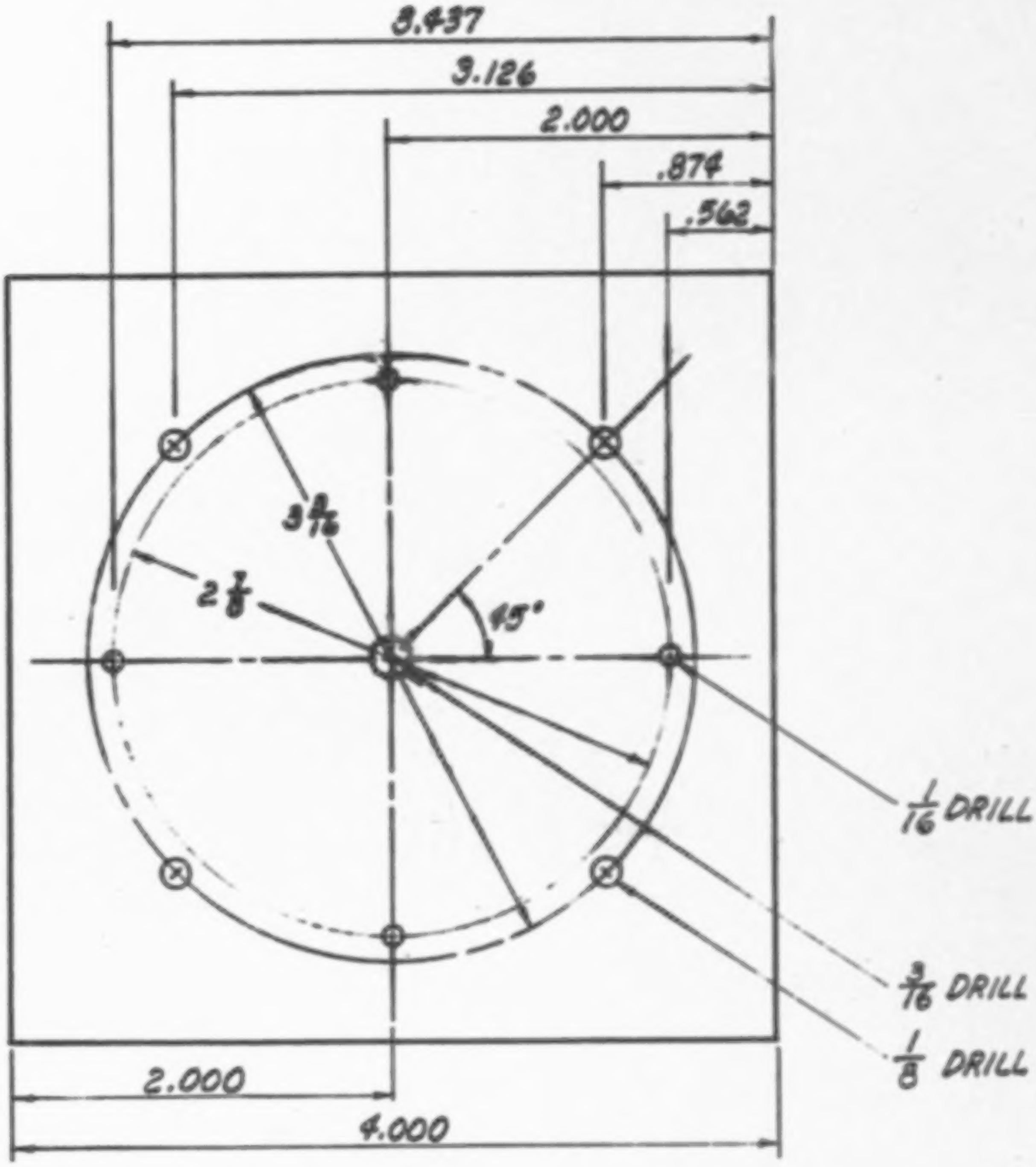
N.C. Code


EOB
RWST
REW
DELETE
0 1 2 3 4 5 6 7 8 9 + −
TC
TAB
8 7 6 5 4 3 2 1
STANDARD EIA 1" TAPE showing channels at the right


3.000"
2.000"
1.000"
X
zero
1.000"
2.000"
3.000"
Y

Process sheet

SC. NC.	SEQ. NO.	TAB OR EOB	+ OR −	"X" COORDINATE	TAB OR EOB	+ OR −	"Y" COORDINATE	TAB OR EOB	INSTRUCTIONS	EOB
	000	T		0	T		0	E	Set up Zero from lower left corner	
[illegible]	001	T	+	1.000	T	+	2.000	E	Bore hole # 1	


3.437
3.126
2.000
.874
.562
3 3/16
2 7/8
45°
1/16 DRILL
3/16 DRILL
1/8 DRILL
2.000
4.000

B.L.D.

AUTOSPOT SKETCH

```
                    MIAMI-DADE JUNIOR COLLEGE

                     AUTOSPOT II PRELIST                   PAGE  1

 1 REMARK/FLANGE PLATE      $ MIAMI-DADE JUNIOR COLLEGE 1967 SUMMER INSTITUTE
 2 REMARK/TP(4.575,-5.077) $ MAXIMUM TABLE POSITION REFERRED TO SET UP POINT
 3 DASH A    (0.575,-1.077) $ DATUM SURFACE OR HOLE (REFERENCE SYSTEM) ID - A
 4 START                    $ GENERATES A SEQUENCE NO. AND A REWIND STOP CODE
 5 DRILL,0625/DAA,AT(2.0,-2.0)R(1.4375)SA(00.0)IA(90.0)NH(4)/DP(0.5)FR(5.0)$
 6 DRILL,1250/DAA,AT(2.0,-2.0)R(1.5938)SA(45.0)IA(90.0)NH(4)/DP(0.5)FR(5.0)$
 7 DRILL,1875/DAA    (2.0,-2.0)                               /DP(0.5)FR(5.0)$
 8 FINI                     $ GENERATES A TOOL CHANGE AND AN AUTO REWIND CODE
```

```
END PREPROCESSOR
SPECIFICATION SECTION

MACHINE SECTION
END PHASE 1
PHASE2 SECTION

END PHASE2

AUTOSPOT-TAPE-O-MATIC POST PROCESSOR

PART NUMBER-      ,NAME
FLANGE PLATE     $ MIAMI-DADE JUNIO
TP(4.575,-5.077) $ MAXIMUM TABLE PO
001X-00575X+01077                    SET POINT         0001
$002     START                                         0002
         FEED RATE 05.0 IN/MIN
          DRILL CHANGE TOOL,TOOL NO. 0625
004X+03437X-02000                    DEPTH 0.5000      0004
005X+02000X-00562                                      0005
006X+00562X-02000                                      0006
007X+02000X-03437                                      0007
         FEED RATE 05.0 IN/MIN
X008      DRILL CHANGE TOOL,TOOL NO. 1250
009X+03126X-00873                    DEPTH 0.5000      0009
010X+00873X-00873                                      0010
011X+00873X-03126                                      0011
012X+03126X-03126                                      0012
         FEED RATE 05.0 IN/MIN
X013      DRILL CHANGE TOOL,TOOL NO. 1875
014X+02U00X-02000                    DEPTH 0.5000      0014
X/015    STOP                                          0015
FINI POST PROCESSOR

 TOTAL PRODUCTION TIME 001.2
```

```
001X0̄00575X0̄01077‡

=002‡

004X0̄03437X0̄02000‡

005X0̄02000X0̄00562‡

006X0̄00562X0̄02000‡

007X0̄02000X0̄03437‡

X008‡

009X0̄03126X0̄00873‡

010X0̄00873X0̄00873‡

011X0̄00873X0̄03126‡

012X0̄03126X0̄03126‡

X013‡

014X0̄02000X0̄02000‡

X1015‡
```

TAPE OUTPUT FROM AUTOSPOT II ACCORDING TO 1620 CHARACTERS

```
001                 -00575          &01077
%002
004                 &03437          -02000
005                 &02000          -00562
006                 &00562          -02000
007                 &02000          -03437
008
009                 &03126          -00873
010                 &00873          -00873
011                 &00873          -03126
012                 &03126          -03126
013
014                 &02000          -02000
/015
```

FRIDEN FLEXOWRITER INTERPRETATION OF TAPE
OUTPUT FROM AUTOSPOT II OUTPUT

COGO

1967 SUMMER INSTITUTE
MIAMI-DADE JUNIOR COLLEGE
COGO

Exercise 1

Write a COGO program using Sketch 21 to determine the following:

1. Find the coordinates, relative to the origin, of the centers of the arcs and circles,
2. Plot the centers found in '1'.

Exercise 2

Write a COGO program using the COGO Sketch to determine the following:

1. The distance from the nose of the median to the intersection of the center lines of Road A and Street 1,
2. The distance and offset measured along and from the center line of Road A of the PC, PRC and PT of the median,
3. The center coordinates of the reverse curve and the area of the median from the nose to the PT,
4. The coordinates of:
   - A. PC and PT of all R/W arcs,
   - B. The center of all R/W arcs.

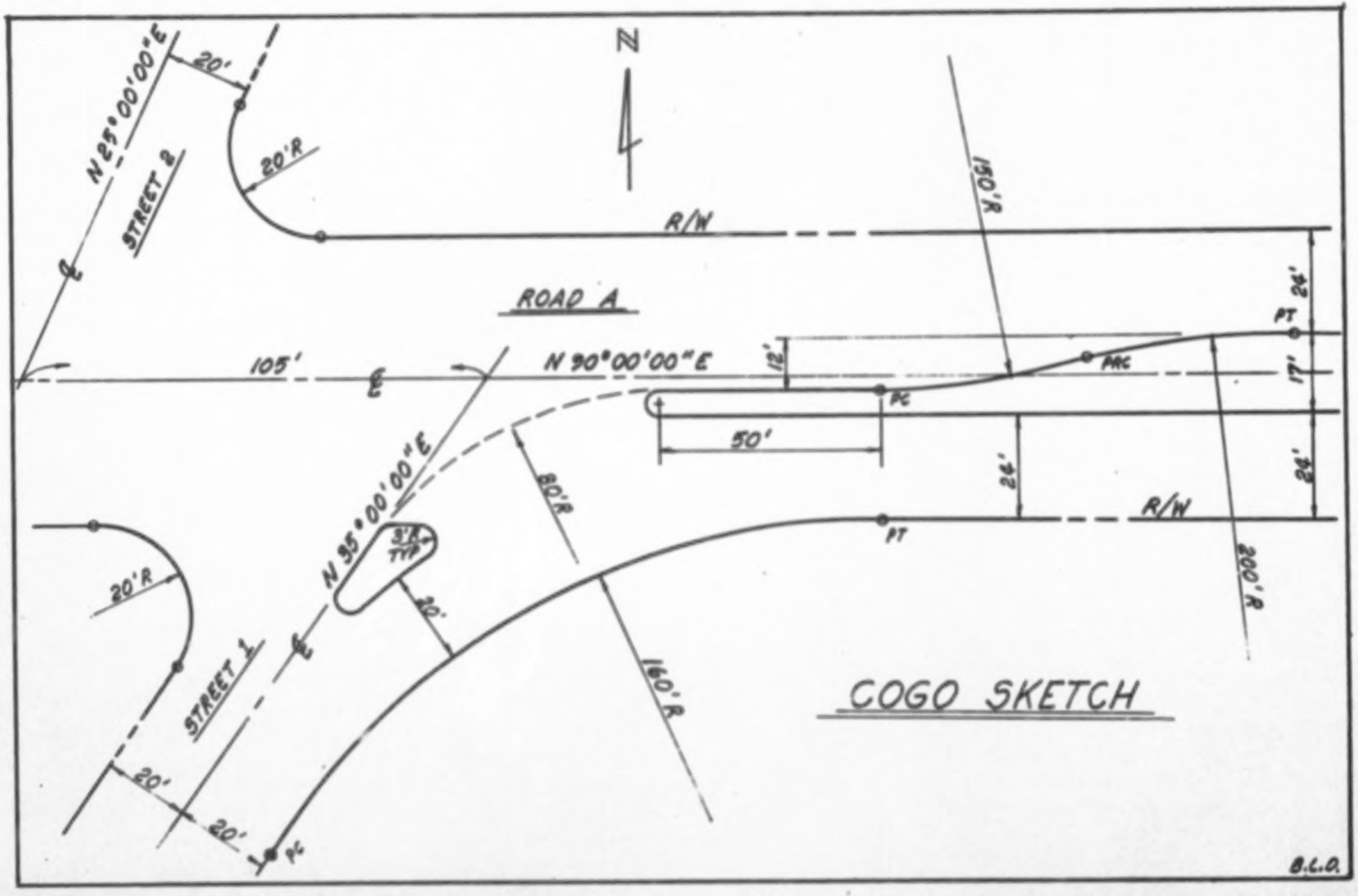
Exercise 3

Write a COGO program using the COGO Sketch and any data from Exercise 2 to determine the following:

1. The distance from the NW corner of the traffic island in Street 1 to the intersection of the center lines of Street 1 and Road A,
2. Center coordinates of the arc of the traffic island,
3. The tangent and deflection angle of the curve that forms the S. R/N line of Road A,
4. Assume the P.C. of the median is at Station 9 + 00.00; find the Station at the PRC and PT of the median.

Exercise 4

Write a COGO program to plot the COGO sketch.


N
N 25°00'00"E
20'
20'R
STREET 2
℄
R/W
ROAD A
105'
℄
N 90°00'00"E
12'
150'R
PRC
PT
24'
17'
24'
PC
50'
24'
R/W
PT
200'R
N 35°00'00"E
80'R
3'R TYP
20'
20'R
℄
STREET 1
160'R
20'
20'
PC
COGO SKETCH
B.L.O.